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FILLER TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

Filler Lot for NASA Lot# 4

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FILLER TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 41. Carbon Content, %
QAI-5560

SAMPLE		
#4-1	#4-2	#4-3
99.75	99.57	99.17
NASA LOT# 4	AVERAGE	99.50

2. Ash Content, %
PTM-71B

	#4-1	#4-2	#4-3
	.005	.000	.010
	<u>.021</u>	<u>.015</u>	<u>.005</u>
AVG.	.013	.008	.008
NASA LOT# 4	AVERAGE	.010	

3. Atomic Absorption, ppm
CTM-53B
(Values are average of
2 determinations)

	#4-1	#4-2	#4-3	LOT#4 AVG.
Na	2.0	2.0	1.0	1.7
K	1.5	2.0	1.0	1.5
Ca	1.5	0.5	1.5	1.2
Mg	1.0	1.0	0.0	0.7
Li	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
TOTAL	6.0	5.5	3.5	5.0

3a. Moisture Content, %
CTM-53B

	#4-1	#4-2	#4-3
	0.018	0.005	0.010
	<u>0.030</u>	<u>0.015</u>	<u>0.015</u>
AVG.	0.024	0.010	0.013
NASA LOT# 4	AVERAGE	0.016	

3b. Ash Content, %
CTM-53B

	#4-1	#4-2	#4-3
	0.005	0.005	0.000
	<u>0.000</u>	<u>0.005</u>	<u>0.000</u>
AVG.	0.003	0.005	0.000
NASA LOT# 4	AVERAGE	0.003	

4. pH, Units
ASTM D1512

	#4-1	#4-2	#4-3
	4.70	4.80	4.80
	<u>4.80</u>	<u>4.85</u>	<u>4.65</u>
AVG.	4.75	4.82	4.72
NASA LOT# 4	AVERAGE	4.76	

5. Particle Size, microns
S.E.M. procedure
(Average values are
of 10 determinations)

	AVG.	#4-1	#4-2	#4-3
		.42	.38	.43
Maximum		.56	.73	.70
Minimum		.20	.20	.23
Std. Dev		.08	.05	.08
NASA LOT# 4	AVERAGE SIZE	.41		

6a. TGA, °C at 50% Loss
CTM-51

	#4-1	#4-2	#4-3
	701	688	697
NASA LOT# 4	AVERAGE	695	

Filler Lot for NASA Lot# 4

6b. TGA
CTM-51

See Charts 6A-6C

7. Particle Size Distribution
CTM-72

See Charts 7A-7C

7a. Particle Size, microns
CTM-72

	<u>#4-1</u>	<u>#4-2</u>	<u>#4-3</u>
	.94	.79	.98
	<u>.94</u>	<u>.82</u>	<u>.91</u>
AVG.	.94	.80	.94
NASA LOT# 4	AVERAGE .89		

U.S. Polymeric



Hamid M. Quraishi, Manager
Quality Assurance Department

Sample: 4-1

Size: 17.543 mg

Run No: MIR #12831 (12)

Date: FEB/04/86 07:06

TGA

OMNITHERM DATA SYSTEM

BECKMAN INDUSTRIAL

Operator: M. WEGENER

Disk ID: DATA DISK #93

File No: D 44.DAT V2.1

Plotted: FEB/04/86 10:23

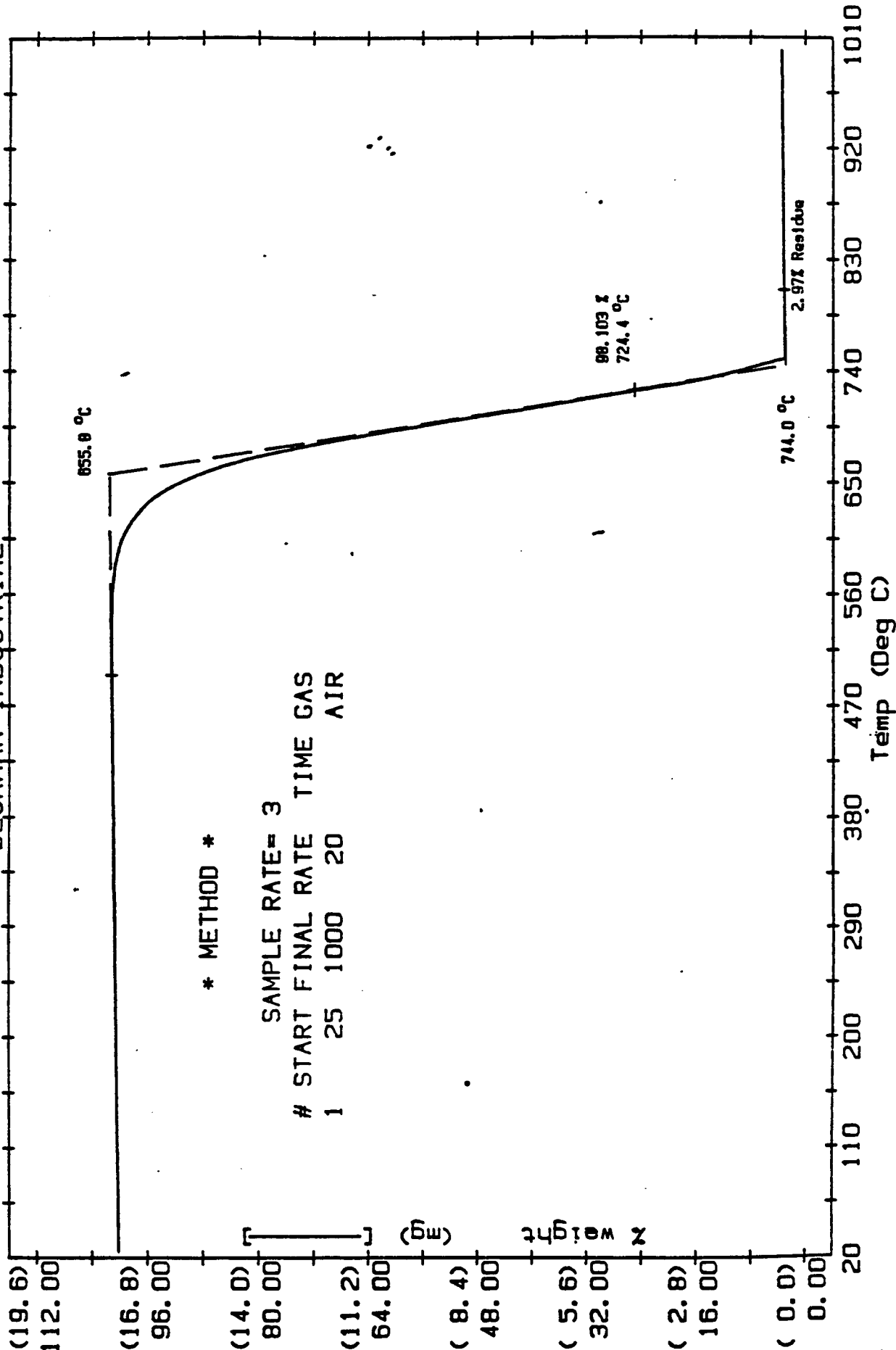


CHART 6A

Beckman Industrial

ANALYTICAL LABORATORY SERVICES

Sample: 4-2
 Size: 19.186 mg
 Run No: MIR #12831 (12)
 Date: FEB/04/86 08:21
 TGA
 OMNITHERM DATA SYSTEM
 BECKMAN INDUSTRIAL
 Operator: M. WEGENER
 Disk ID: DATA DISK #93
 File No: D 45.DAT V2.1
 Plotted: FEB/04/86 10:54

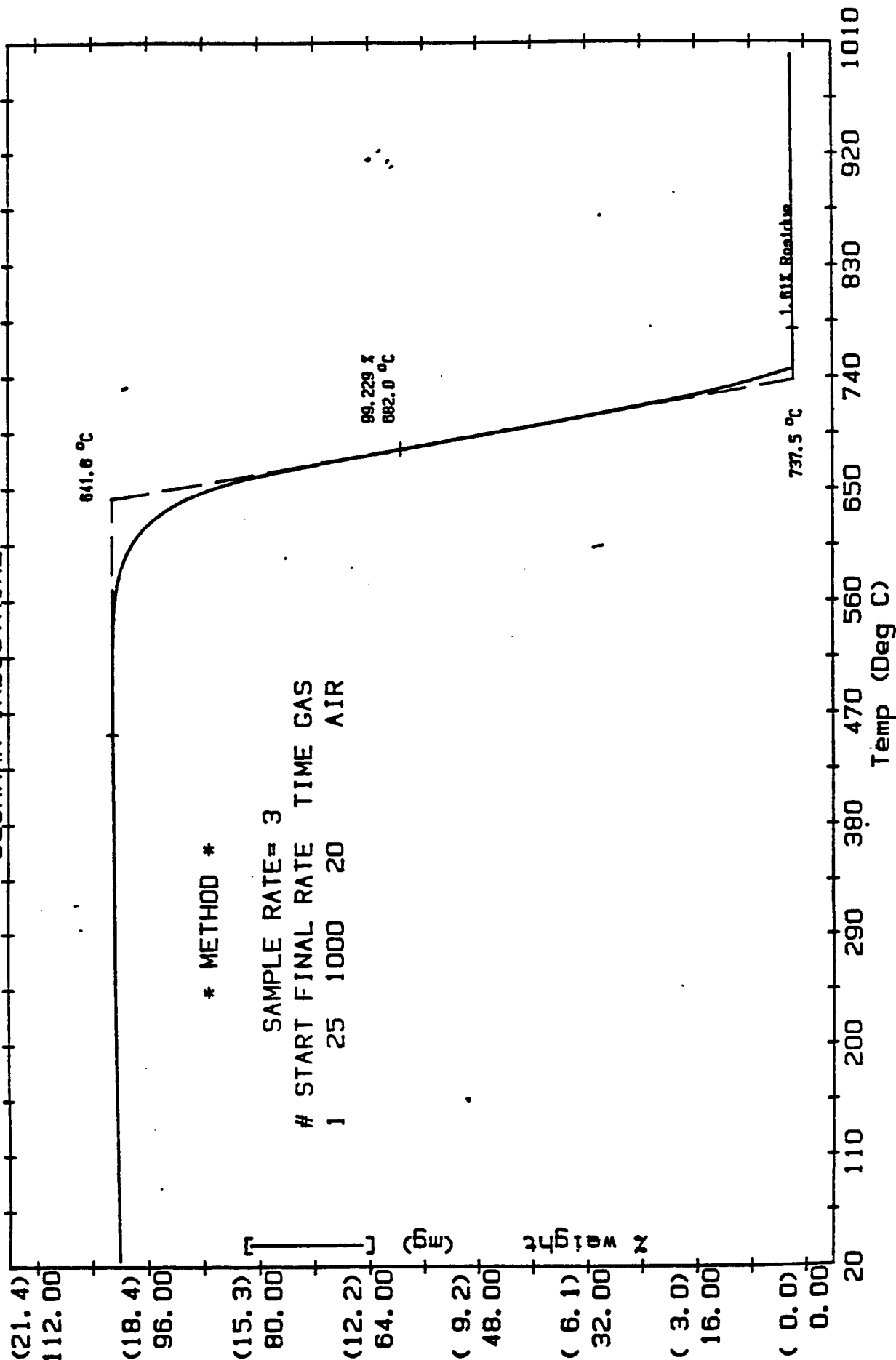


Figure #6

Sample: 4-3
Size: 15.594 mg
Run No: MIR #12831 (12)
Date: FEB/04/86 10:14

TGA
OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #93
File No: D 46.DAT V2.1
Plotted: FEB/04/86 11:43

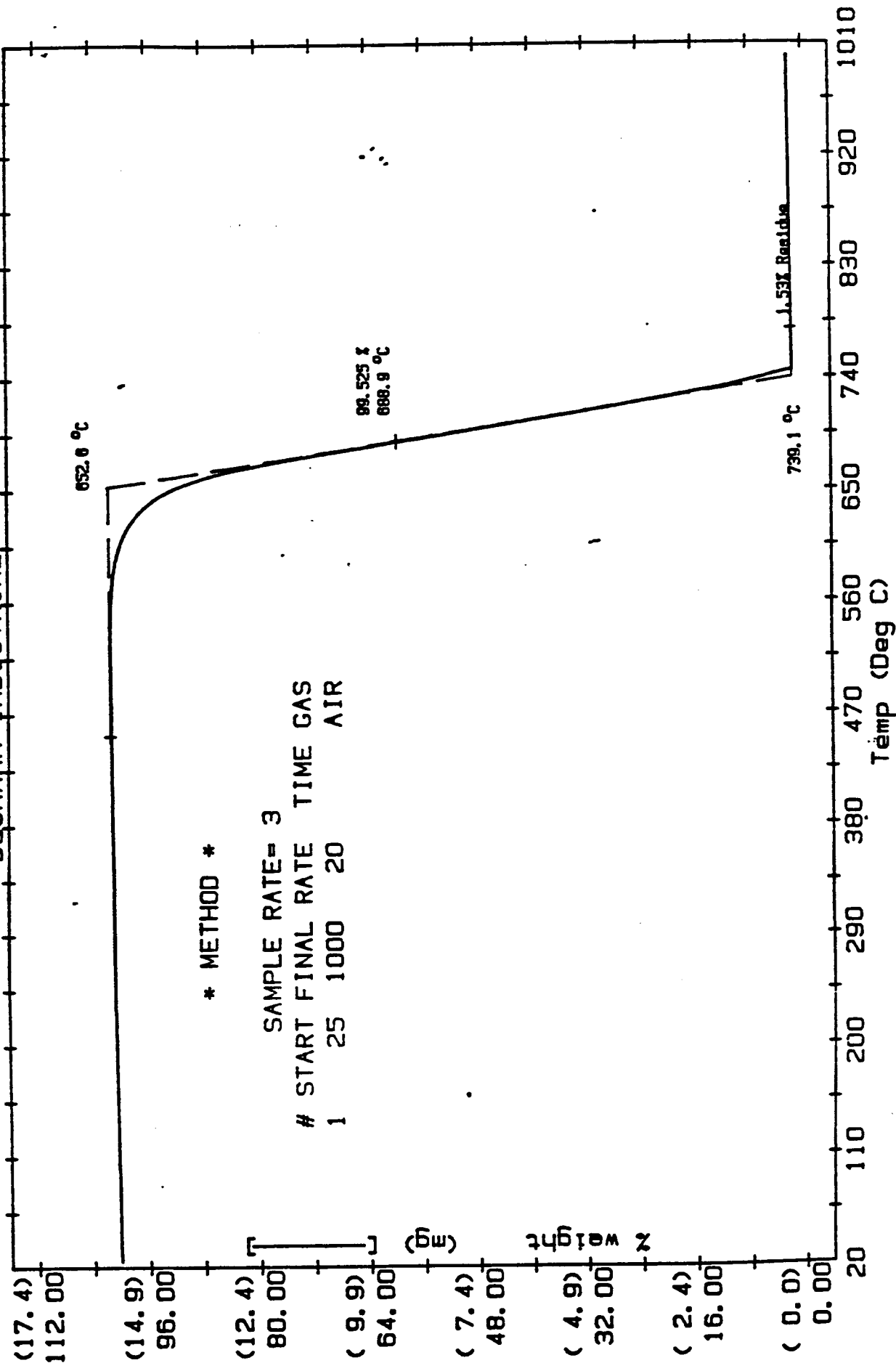


CHART 6C

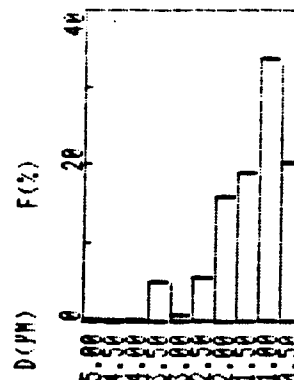
Beckman Industrial™

ANALYTICAL LABORATORY SERVICES

* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.0	0.0
3.50-3.00	5.1	5.1
3.00-2.50	0.6	5.7
2.50-2.00	5.5	11.2
2.00-1.50	16.0	27.2
1.50-1.00	16.8	46.0
1.00-0.50	33.7	79.7
0.50-0.00	20.3	100.0
D(AVE)	0.94 (PM)	

* DISTRIBUTION GRAPH (BY VOL.)



Lot #4-1
Sample #2

HORIBA CAPA-500

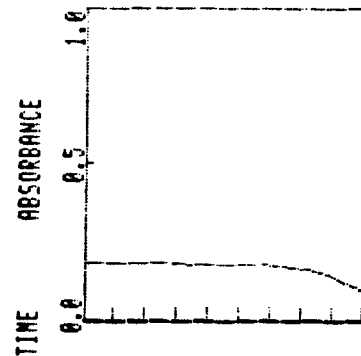
PARTICLE ANALYZER

DATE 5-23-86
#2 SAMPLE NASA Lot #4-1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml
* CONDITIONS

SOLV. VISC 19.90 (CP)
SOLV. DENS 1.11 (G/CC)
SAMP. DENS 1.90 (G/CC)
D(MAX) 5.0 (PM)
D(MIN) 0.01 (PM)
D(DIV) 0.50 (PM)
SPEED 5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

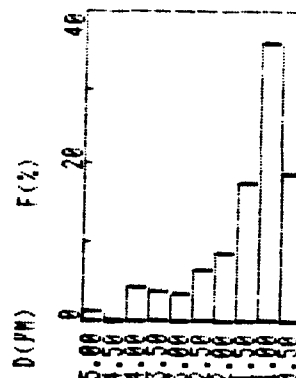
* DATA



* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	1.1	1.1
4.50-4.00	0.0	1.1
4.00-3.50	4.4	5.5
3.50-3.00	3.0	9.3
3.00-2.50	3.4	12.7
2.50-2.00	6.5	19.2
2.00-1.50	8.6	27.9
1.50-1.00	17.5	45.4
1.00-0.50	35.8	81.2
0.50-0.00	18.8	100.0
D(AVE)	0.94 (PM)	

* DISTRIBUTION GRAPH (BY VOL.)



Lot #4-1
Sample #1

HORIBA CAPA-500

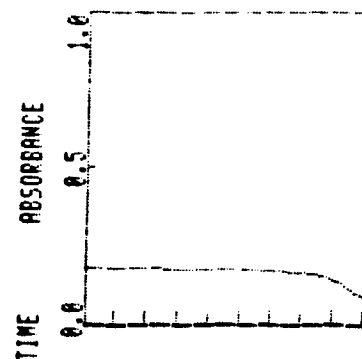
PARTICLE ANALYZER

DATE 5-23-86
#1 SAMPLE NASA Lot #4-1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml
* CONDITIONS

SOLV. VISC 19.90 (CP)
SOLV. DENS 1.11 (G/CC)
SAMP. DENS 1.90 (G/CC)
D(MAX) 5.0 (PM)
D(MIN) 0.01 (PM)
D(DIV) 0.50 (PM)
SPEED 5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA



HORIBA CAPA-500
PARTICLE ANALYZER

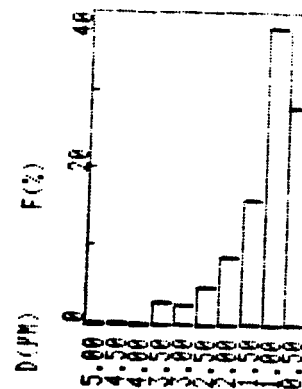
DATE 5-27-86
#1 SAMPLE NASA Lot#4-2
SOLVENT ETHYL GLYCOL
C=0.01mg/ml

* DISTRIBUTION TABLE (BY VOL.)

D(µM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.0	0.0
3.50-3.00	2.7	2.7
3.00-2.50	2.4	5.1
2.50-2.00	4.7	9.8
2.00-1.50	8.4	18.2
1.50-1.00	15.7	33.9
1.00-0.50	38.1	72.0
0.50-0.00	28.0	100.0

D(AVE) 0.79 (µM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#4-2
Sample#1

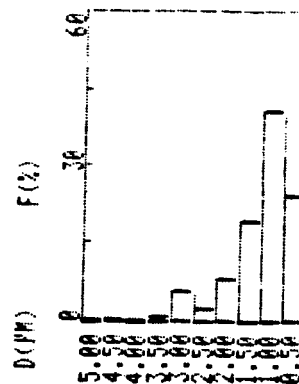
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OF POOR QUALITY

* DISTRIBUTION TABLE (BY VOL.)

D(µM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.0	0.0
3.50-3.00	0.7	0.7
3.00-2.50	5.5	6.2
2.50-2.00	2.2	8.4
2.00-1.50	7.9	16.3
1.50-1.00	19.2	35.5
1.00-0.50	41.1	76.5
0.50-0.00	23.5	100.0

D(AVE) 0.82 (µM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#4-2
Sample#2

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#2 SAMPLE NASA Lot#4-2
SOLVENT ETHYL GLYCOL
C=0.01mg/ml

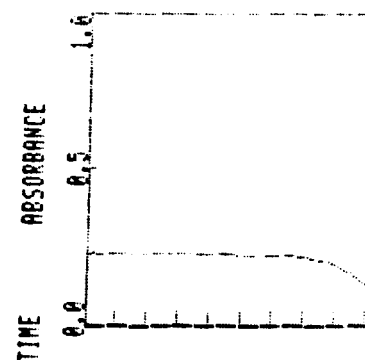
* CONDITIONS

SOLV.VISC 19.90(CP)
SOLV.DENS 1.11(G/CC)
SAMP.DENS 1.90(G/CC)
D(MAX) 5.0 (µM)
D(MIN) 0.01(µM)
D(DIV) 0.50(µM)

SPEED 5000. (RPM)

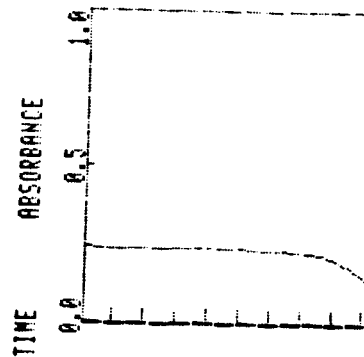
* TIME 0 H 11 MIN 31 SEC

* DATA



* TIME 0 H 11 MIN 31 SEC

* DATA



* DISTRIBUTION TABLE (BY VOL.)

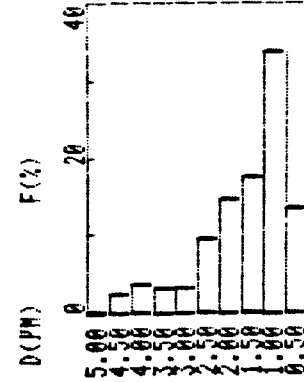
HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-2-78
SAMPLE NASA LOT#5A-3
#1 SOLVENT ETHYL GLYCOL
C=0.01mg/ml
* CONDITIONS

SOLV.VISC 19.90(CP)
SOLV.DENS 1.11(G/CC)
SAMP.DENS 1.90(G/CC)
D(MAX) 5.0 (PM)
D(MIN) 0.01(PM)
D(DIV) 0.50(PM)
D(AVE) 1.08 (PM)

SPEED 5000. (RPM)

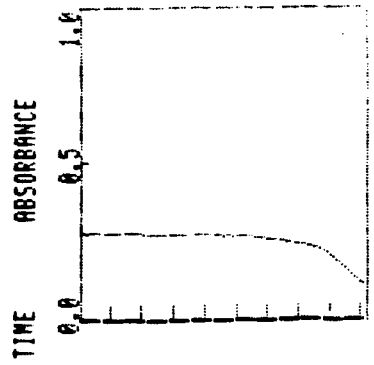
* DISTRIBUTION GRAPH (BY VOL.)



Lot #5A-3
Sample #1

* TIME 0 H 11 MIN 31 SEC

* DATA



* DISTRIBUTION TABLE (BY VOL.)

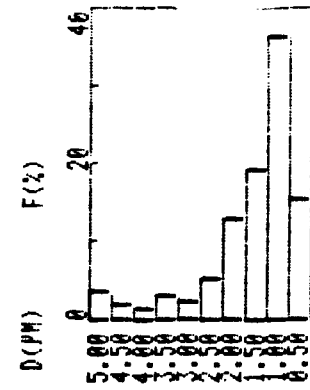
HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-2-78
SAMPLE NASA LOT#5A-3
#2 SOLVENT ETHYL GLYCOL
C=0.01mg/ml
* CONDITIONS

SOLV.VISC 19.90(CP)
SOLV.DENS 1.11(G/CC)
SAMP.DENS 1.90(G/CC)
D(MAX) 5.0 (PM)
D(MIN) 0.01(PM)
D(DIV) 0.50(PM)
D(AVE) 0.98 (PM)

SPEED 5000. (RPM)

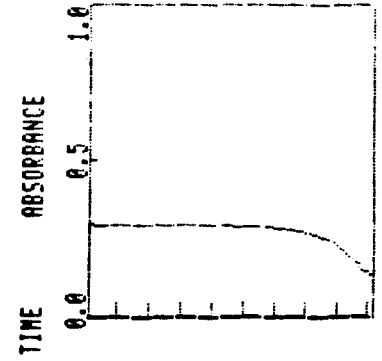
* DISTRIBUTION GRAPH (BY VOL.)



Lot #5A-3
Sample #2

* TIME 0 H 11 MIN 31 SEC

* DATA



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RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

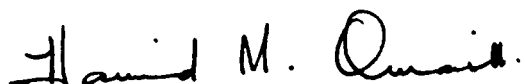
91LD Resin Lot for NASA Lot# 4

1. Resin Solids, % PTM-7C	#4-1 70.6 71.4 <u>70.8</u> AVG. 70.9
2. Specific Gravity @ 25°C PTM-29C	1.140
3. Viscosity, Brookfield, cps. @ 22.8°C PTM-14C	895
4. Gel Time, min:sec PTM-47B	3:10
5. Atomic Absorption, ppm CTM-53B	Na 13 K 1 Ca 2 Mg 8 Li <u>0</u> AVG. 24
6. Volatiles, Gas Chromatography CTM-55	See Chart 6A
7. TGA, % Weight Loss at 500°C CTM-51 (AIR)	8.1 (U.S.P.) See Chart 7A
8. DSC, temperature °C CTM-50A	186 See Chart 8A
9. HPLC CTM-49A	See Chart 9A
10. GPC, Average molecular wt. CTM-49A	1964 See Chart 10A
11. pH, units CTM-1B	8.2

91LD Resin Lot for NASA Lot# 4

12. Phenol Content, % CTM-55 Appendix 1	#4-1		
	11.57		
	<u>11.69</u>		
	AVG. 11.63		
13. Chang's Index, ml. CTM-5B	24.5		
14. RDS, Minimum Viscosity, cps. CTM-57A		<u>Min. Visc.</u>	<u>°C</u>
	#4-1	323	105
	See Chart 14A		
15. NMR Vendor procedure	See Chart 15A		

U. S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

TYPICAL GAS CHROMATOGRAPH SET-UP

ORIGINAL PAGE 33
OF 300A QUALITY

Operator <u>D. J. J.</u>	Date <u>12/11/86</u>
Column <u>6 ft.</u>	Detector <u>FID</u>
Length <u>1/4 in.</u>	Voltage <u> </u>
Dia. <u>AT-1000</u>	Sensit. <u> </u>
Liquid Phase <u>Wt. % 0.1</u>	Flow Rates, ml/min
Support <u>GRAPHAC</u>	Hydrogen <u>60</u> Air <u>96</u>
Mesh <u>80/100</u>	Scavenge <u> </u>
Carrier Gas <u>He</u>	Split <u> </u>
Rotameter <u> </u>	Temperature, °C
Inlet Press <u>60</u> psig	Det. <u>220</u> Inj. <u>200</u>
Rate <u>30</u> ml/min	Column Initial <u>60</u>
CHART SPEED <u> </u>	Final <u>210</u>
SAMPLE <u>91LD, 4-1</u>	Rate <u>500/MIN</u>
Size <u>0.1 ml</u>	Solvent <u>THF</u>
	Concn. <u>0.10028 g/ml</u>

GAS CHROMATOGRAPHY STANDARD SOLVENT

TEST METHOD CTM-55

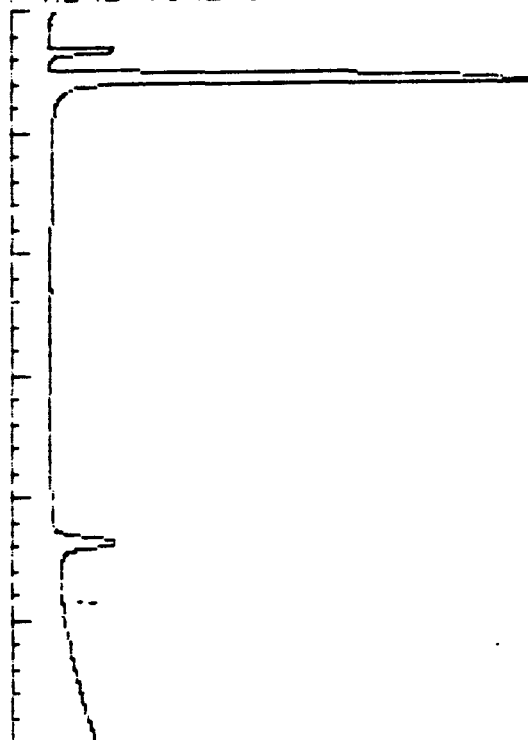
STANDARD SOLVENT/MONOMERRETENTION TIME (MINS.)

MEOH	.6
ETHANOL	1.18
MECL ₂	1.28
ACETONE	1.45
IPA	1.83
THF	3.08
ACETONITRILE	3.2
CRESOL	4.03
MEK	4.08
FURFURAL	15.03
TOLUENE	17.98
CHLOROBENZENE	19.6
PHENOL	22.08

NOTE: THF WAS USED TO DILUTE THE RESIN SAMPLES.

*** REAL TIME CHROMATOGRAM ***

VERTICAL SCALE FACTOR: 1X



FINAL FULL SCALE MV.=1000.00

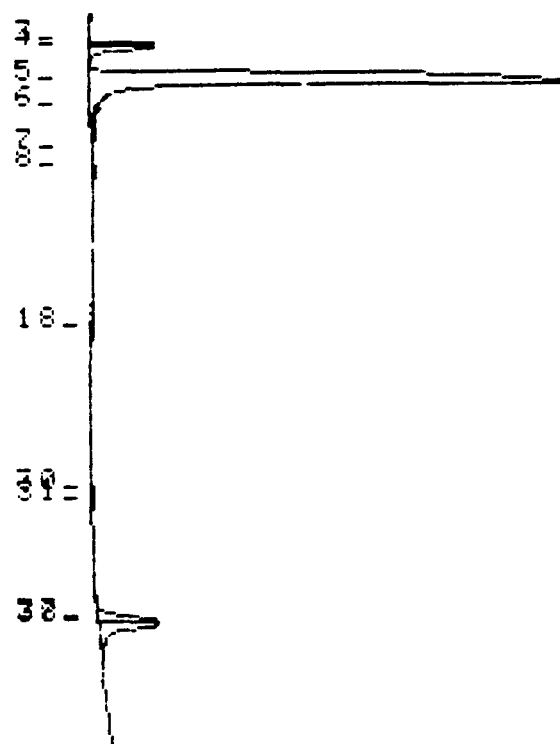
SAMPLE: 91 LD 4-1
MISC.: C=0.10028 GMS/ML

TIME: 8:08
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
1	.60	3478	.115	1	529
3	1.58	70505	2.322	2	11919
4	1.70	147000	4.841	2	11935
5	3.00	2376300	78.256	3	91188
6	3.85	34523	1.137	4	956
7	5.40	2171	.072	4	173
8	5.98	7385	.243	2	263
18	11.60	5476	.180	2	274
30	17.35	4813	.159	2	143
31	17.70	1782	.059	3	92
37	21.83	176570	5.815	2	11090
38	21.95	206570	6.803	2	11029

TOTAL AREA= 3036575
THRESHOLD= 1
MIN. PK. WIDTH= 15
AREA REJECT= 1000



SAMPLE: 91 LD 4-1
MISC.: C=0.10028 GMS/ML

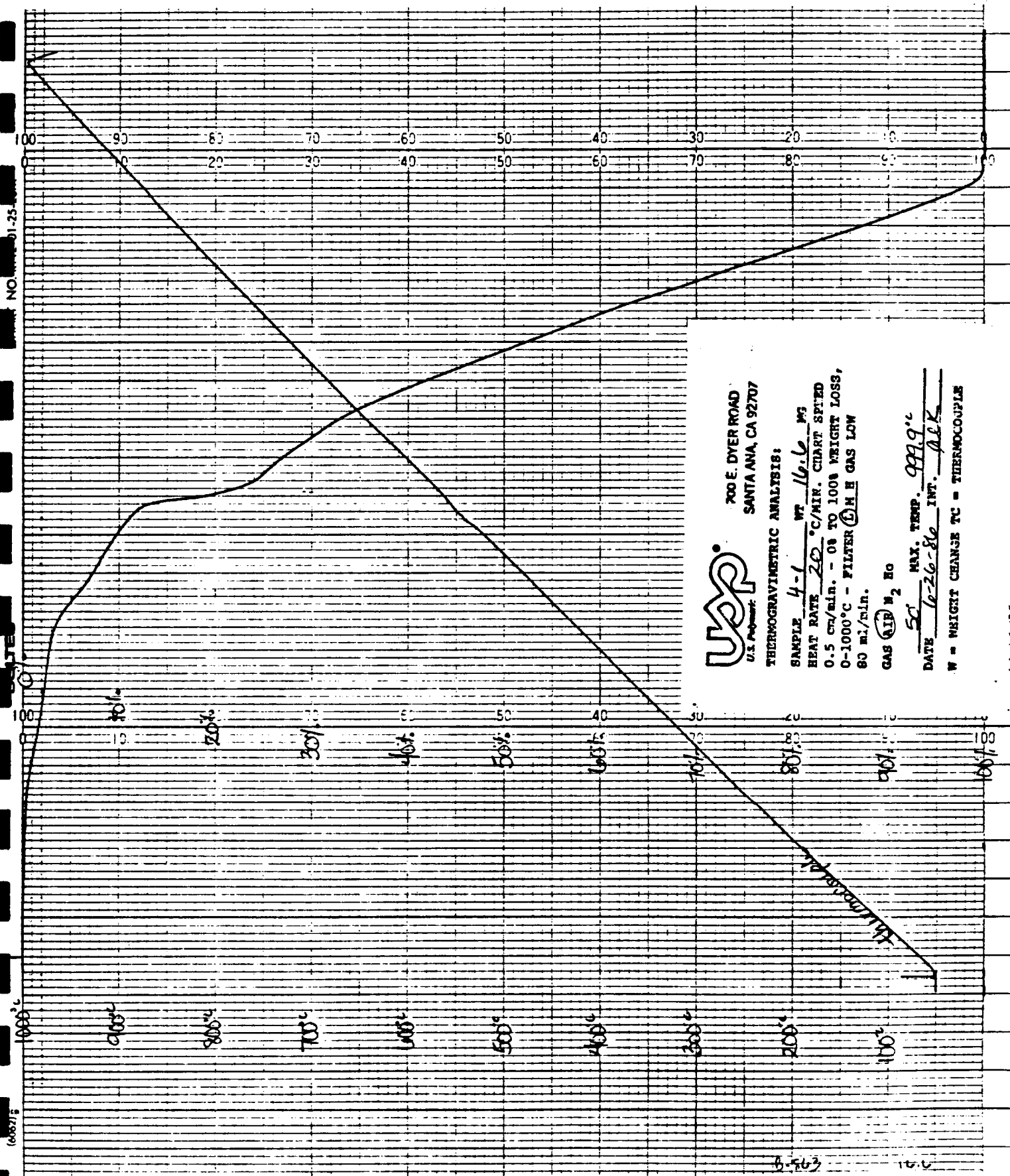
TIME: 8:08
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
3	1.58	70505	2.341	2	11919
4	1.70	147000	4.881	2	11935
5	3.00	2376300	78.908	3	91188
6	3.85	34523	1.146	4	956
37	21.83	176570	5.863	2	11090
38	21.95	206570	6.859	2	11029

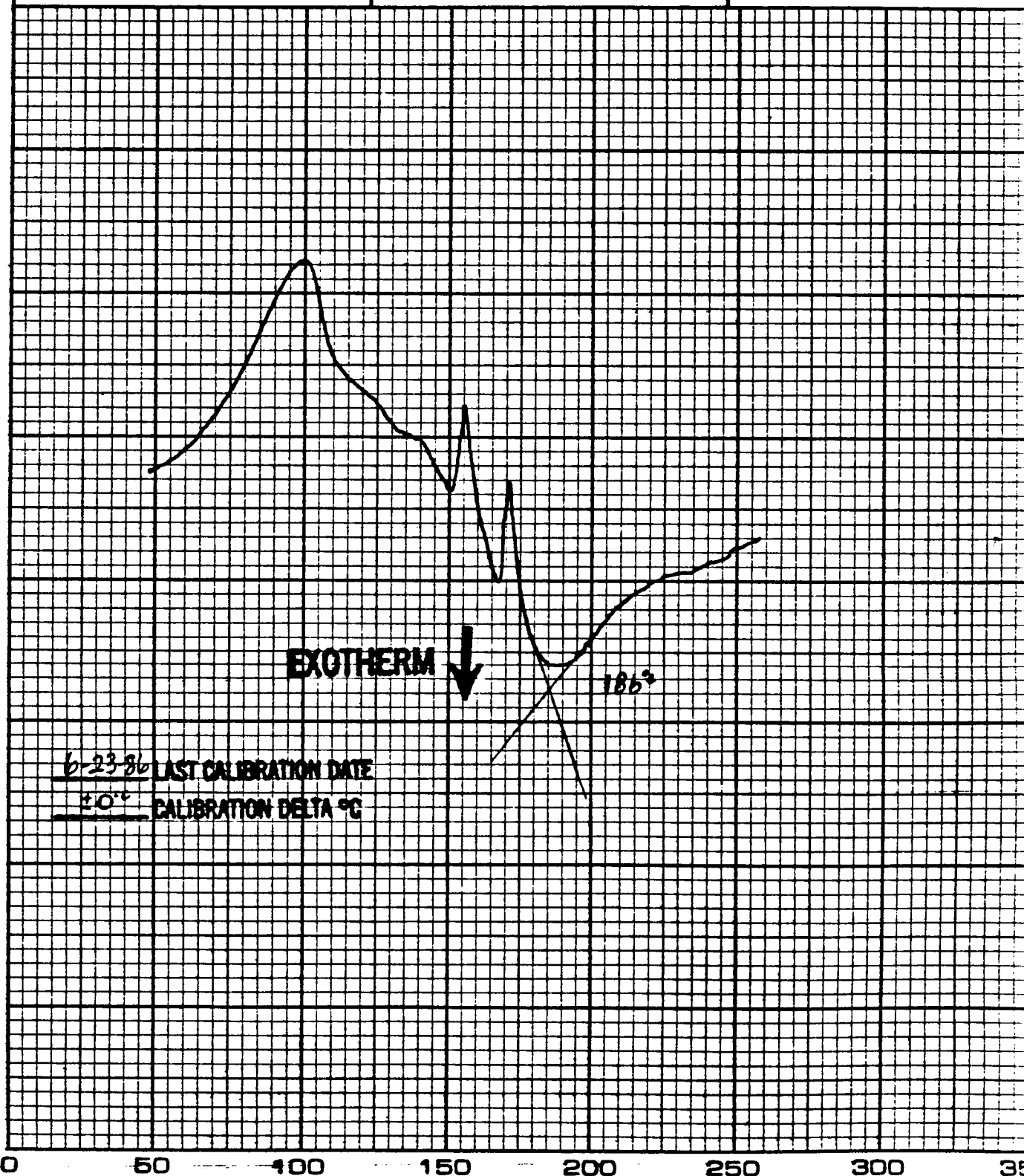
TOTAL AREA= 3011468
THRESHOLD= 1
MIN. PK. WIDTH= 15
AREA REJECT= 10000

ORIGINAL PAGE 35
OF 6000 QUALITY



ORIGINAL PAGE IS
OF POOR QUALITY

RUN NO. _____ DATE <u>6-23-86</u>	ORIGINAL PAGE IS OF POOR QUALITY	DTA-DSC
OPERATOR <u>JKK</u>	SCALE, °C/in <u>50</u>	SCALE, °C/in <u>5.0</u> <u>15</u>
SAMPLE: _____	PROG. RATE, °C/min <u>20</u>	(mcal/sec)/in _____
_____ 4-1	HEAT <input checked="" type="checkbox"/> COOL <input type="checkbox"/> ISO <input type="checkbox"/>	WEIGHT, mg <u>6.1</u>
ATM. <u>N₂</u> @ <u>1 atm</u>	SHIFT, in <u>0</u>	REFERENCE _____
FLOW RATE <u>40 ml/min</u>	_____	<u>1 alum seal</u>



DUPONT Instruments

MEASURED VARIABLE

DATA FILE A:PHEN033.HDR TAKEN 09-05-1986 14:53:19

***** AREA PERCENT REPORT *****

* Sample Name: 91LD,4-1,C=7.02 Operator Initials: JGZ *
* Date: 09-05-1986 14:53:19 Method:PHENOLIC DATA FILE: A:PHEN033.PTS *
* Interface: 4 Cycle#: 33 Channel#: 0 Vial#: N.A. *
* Starting Peak Width: 10 Threshold: .01 *

* Instrument Type: BECKMAN HPLC Column Type: MICROBONDAPAK C-18 *
* Solvent Description: THF/WATER, 2:1 BY WEIGHT *
* Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN *
* Detector 0: 220NM/.5AU Detector 1: *
* Misc. Information: LENGTH=25 *

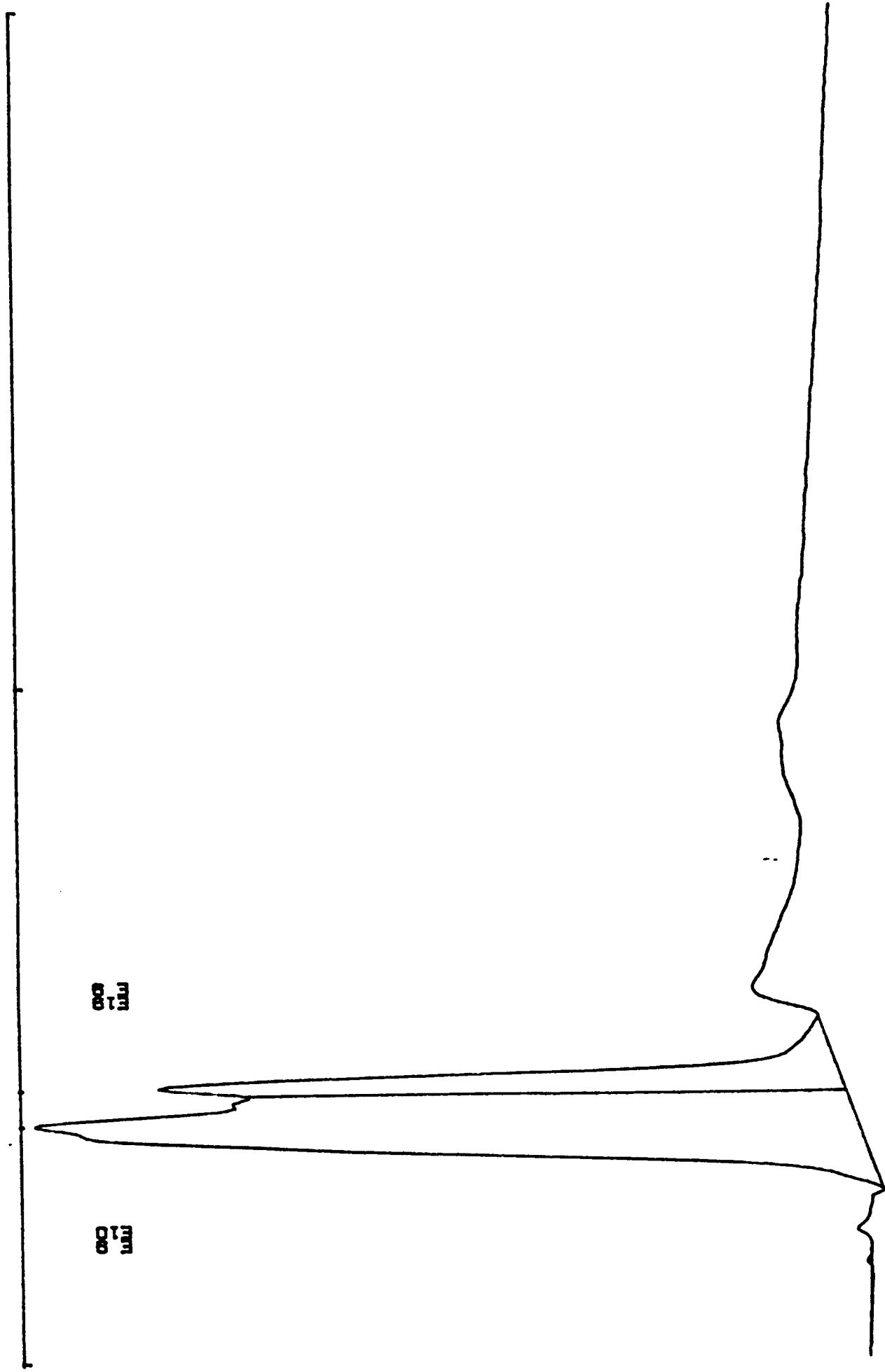
Starting Delay: 0.00 Ending Retention Time: 10.00

Peak No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
3	1.78	124818	73.2381	2	5258	100.000	23.7
4	2.05	45610	26.7619	2	4375	36.541	10.4

Total Area: 170428 Area Reject: 1000 One sample per 1.000 sec.

DATA FILE=PHEN033 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.401 Mv. HIGH SCALE= 10.837 Mv.
91 LD. 4-1, C=7.02 MG/ML, 9/5/86, JGZ

1.76
0.00
N



GPC CALIBRATION PLOT

*** Calibration Data ***

Calibration Name:

Misc Information:

Fit Type: 3

Log Mol Wt = $A + Bx + Cx^2 + Dx^3$

A= 2.538977 B= 2.115815 C= -.5646824

D= 3.606432E-02

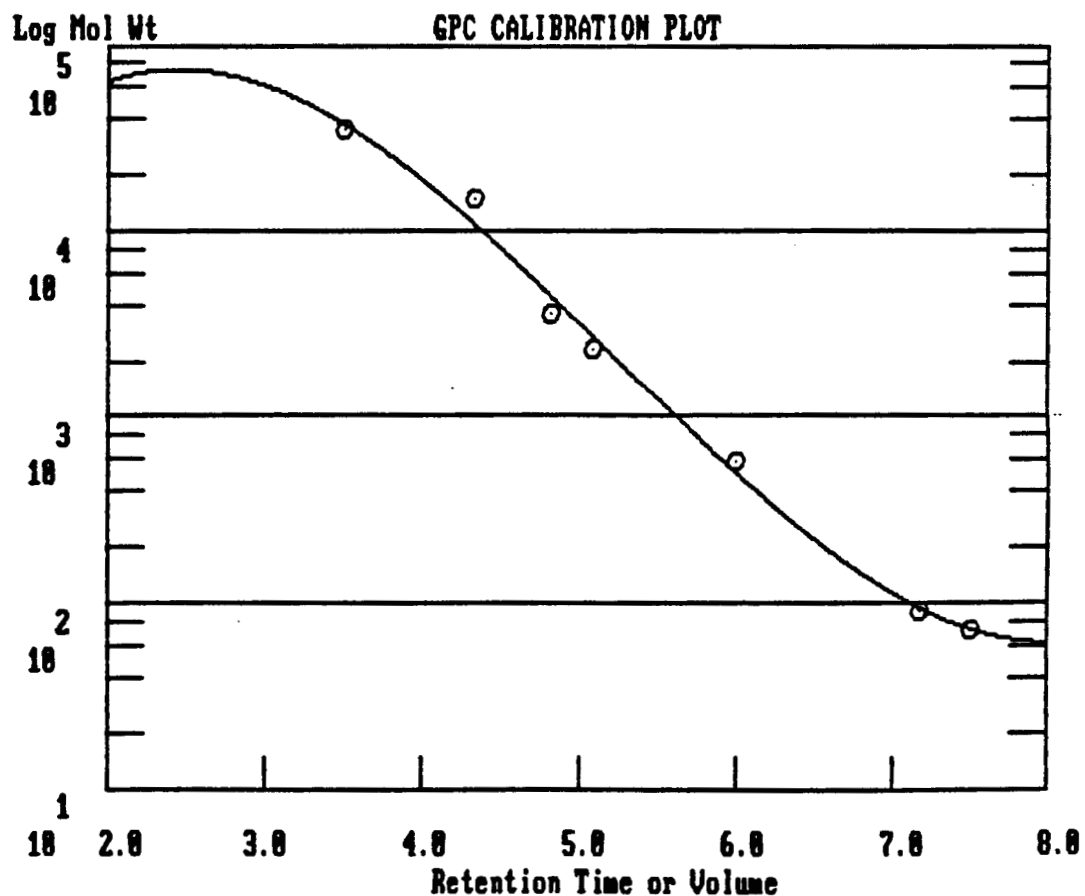
Coefficient of Determination: 0.9902

Ret Time

Molecular Weight

Log Mol Wt

3.50	35000	4.544
4.33	15000	4.176
4.83	3600	3.556
5.09	2350	3.371
6.00	570	2.756
7.17	92	1.964
7.50	72	1.857



***** GPC REPORT *****

```

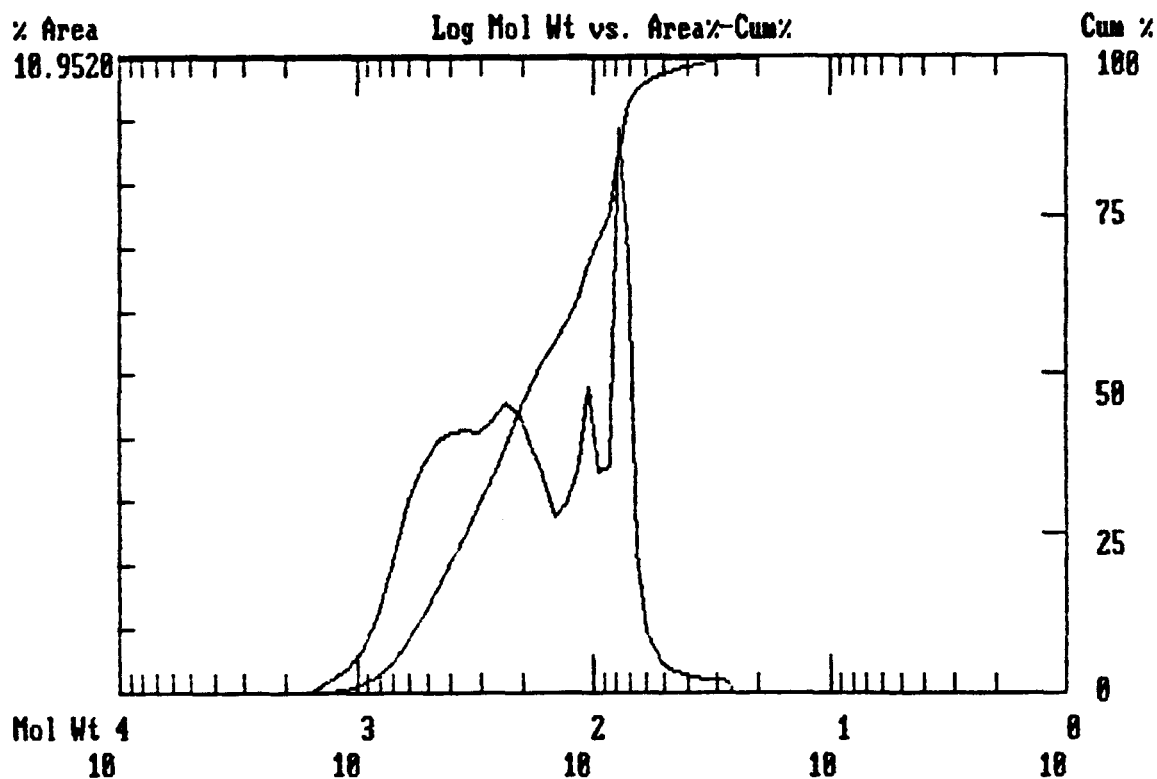
*****
* Sample Name: 9/LD 5A                      Operator Initials: FCB      *
* Date: 10-03-1986 09:47:41 Method:          DATA FILE: A:GPC20.PTS    *
* Interface: 2                               Cycle#: 20                 *
* Starting Peak Width: 60 Threshold: 0       Channel#: 0 Vial#: N.A.    *
*****
* Instrument Type: HPLC BECKMAN 334          Column Type: ULTRASTYRAGEL 500A *
* Solvent Description: THF                   *
* Operating Conditions: R.T., FLOW RATE=2.0 ML/MIN *
* Detector 0: 254NM/.1AU                     Detector 1: *
* Misc. Information: CALIBRATION/GPC         *
*****

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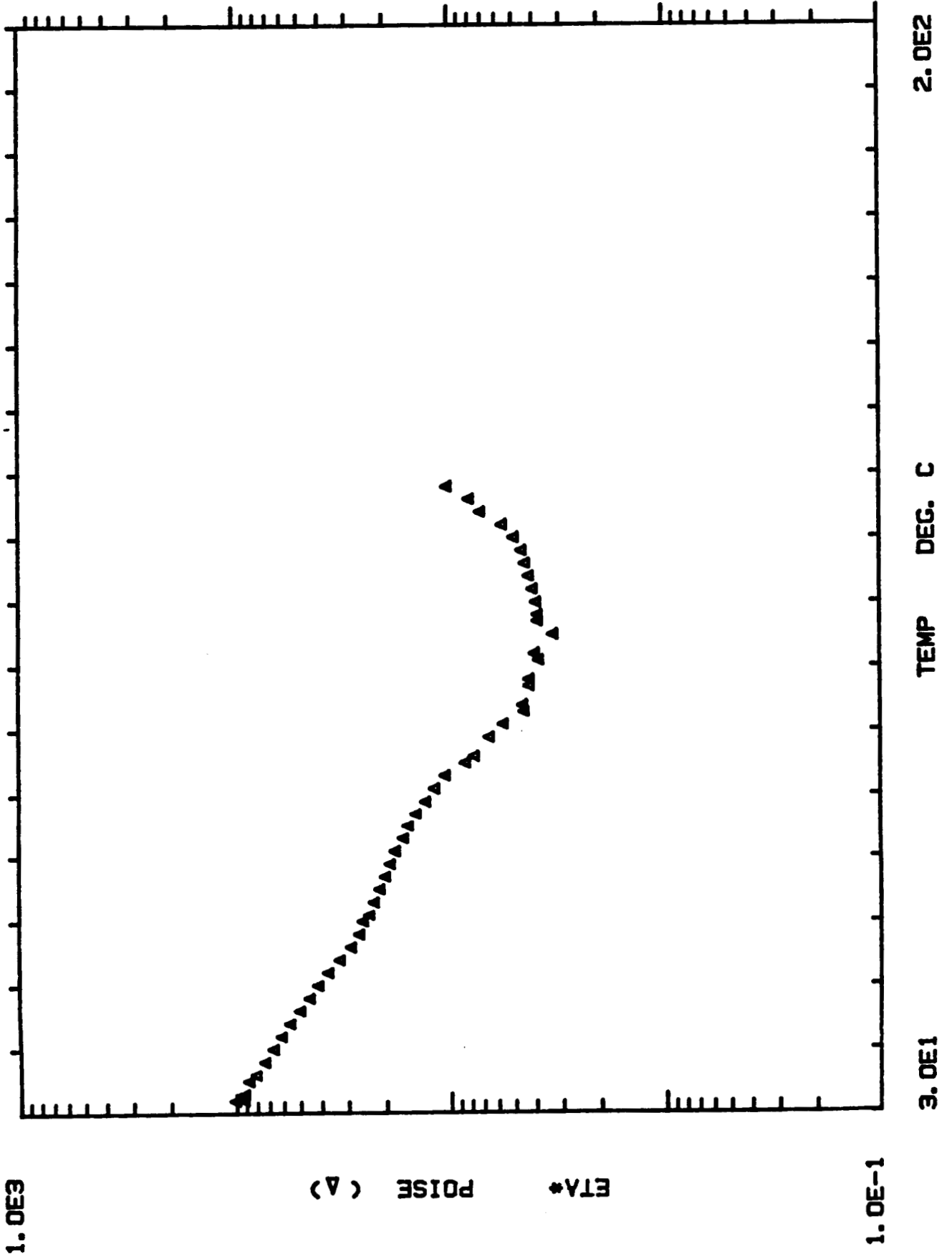
Starting Delay: 0.00                      Ending Retention Time: 10.00
Calibration file: GPCMIX
Molecular Weight Distribution Averages
Baseline TIMES: 0.05 to 10.00 MW: %565381040000 to 353268
Process TIMES: 0.05 to 10.00 MW: %565381040000 to 353268
Total Area: 186951
Mw= 235
Mn= 128
Mw/Mn= 1.8398
Mz= 408

```



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NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN B-863 NASA LOT4-1 USP#35959/8



Rheometrics RECAP II.

Experiment No. : 19 Sample No. : 1

Title :
NASA FINGERPRINT VISCOSITY PROFILE WILD RESIN B-863 NASA LOT4-1 USP#35959/B

Operator : CRISTINA P

Date and Time : Wednesday, August 20, 1986 - 16:07:04

Operating Mode : DYNAMIC

Sweep Type : CURE

Geometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

Notes :

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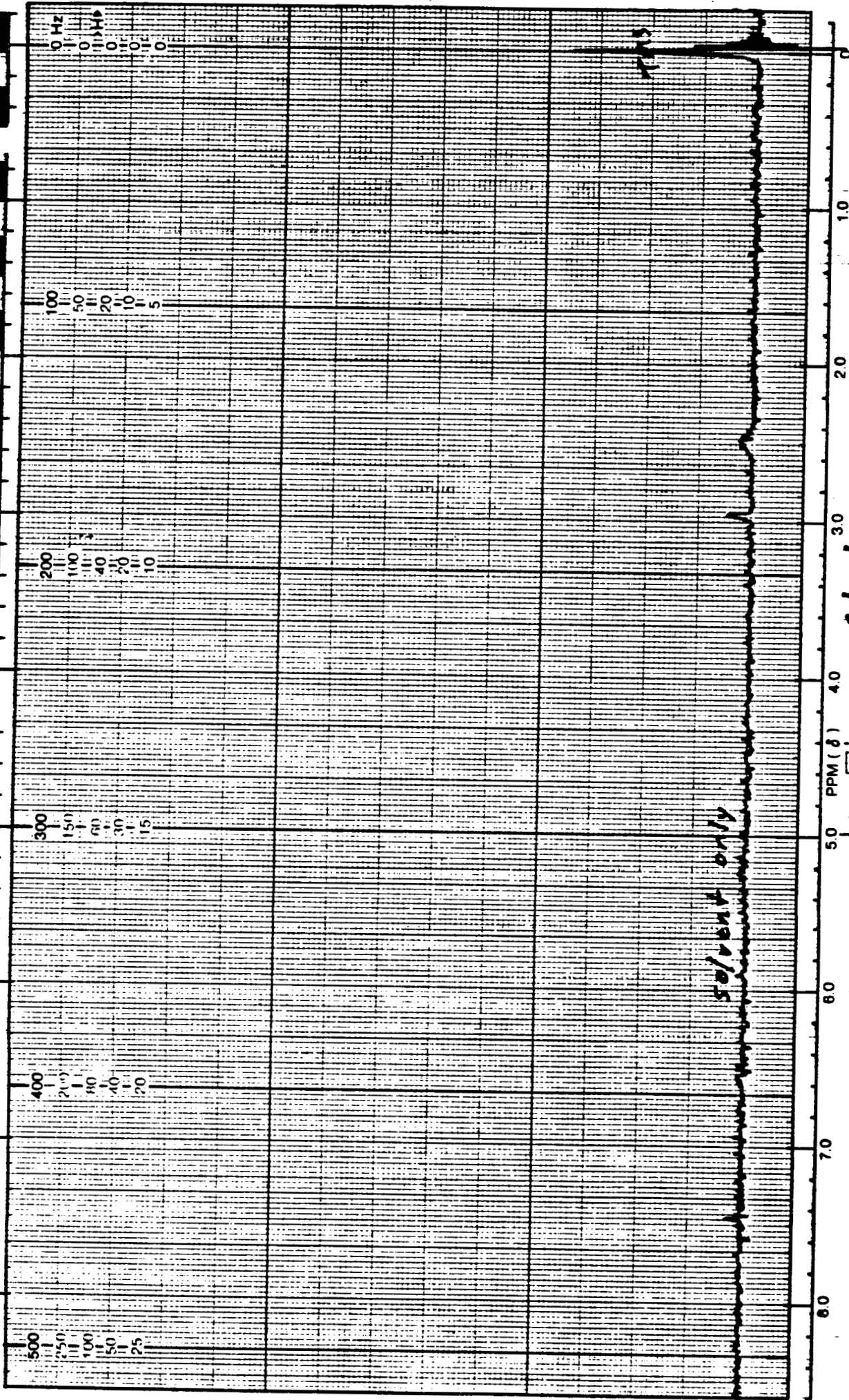
NASA FINGERPRINT VISCOSITY PROFILE 91LD-RESIN B-863 NASA LOT4-1 USP#35959/B

D.	ETA* POISE	ETA' POISE	ETA'' POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	9.913e+001	8.597e+001	4.934e+001	1.245e+001	2.000e+001	3.200e+001
2	8.994e+001	8.011e+001	4.087e+001	1.130e+001	1.000e+000	3.200e+001
3	8.983e+001	8.072e+001	3.941e+001	1.129e+001	2.000e+000	3.300e+001
4	8.567e+001	7.718e+001	3.720e+001	1.075e+001	3.000e+000	3.500e+001
5	7.923e+001	7.136e+001	3.442e+001	9.947e+000	4.000e+000	3.600e+001
6	7.192e+001	6.472e+001	3.137e+001	9.028e+000	5.000e+000	3.800e+001
7	6.556e+001	5.843e+001	2.974e+001	8.228e+000	6.000e+000	4.000e+001
8	6.012e+001	5.282e+001	2.873e+001	7.550e+000	7.000e+000	4.200e+001
9	5.478e+001	4.705e+001	2.805e+001	6.876e+000	8.000e+000	4.400e+001
10	4.918e+001	4.102e+001	2.712e+001	6.175e+000	9.000e+000	4.600e+001
11	4.431e+001	3.562e+001	2.635e+001	5.567e+000	1.000e+001	4.800e+001
12	4.047e+001	3.139e+001	2.554e+001	5.081e+000	1.100e+001	5.000e+001
13	3.632e+001	2.784e+001	2.333e+001	4.563e+000	1.200e+001	5.200e+001
14	3.206e+001	2.429e+001	2.093e+001	4.025e+000	1.300e+001	5.400e+001
15	2.842e+001	2.211e+001	1.785e+001	3.570e+000	1.400e+001	5.600e+001
16	2.601e+001	2.053e+001	1.597e+001	3.266e+000	1.500e+001	5.800e+001
17	2.502e+001	2.043e+001	1.444e+001	3.142e+000	1.600e+001	6.000e+001
18	2.335e+001	1.889e+001	1.373e+001	2.931e+000	1.700e+001	6.100e+001
19	2.220e+001	1.853e+001	1.223e+001	2.786e+000	1.800e+001	6.300e+001
20	2.088e+001	1.799e+001	1.060e+001	2.621e+000	1.900e+001	6.500e+001
21	1.965e+001	1.727e+001	9.363e+000	2.466e+000	2.000e+001	6.700e+001
22	1.864e+001	1.676e+001	8.170e+000	2.338e+000	2.100e+001	6.900e+001
23	1.765e+001	1.618e+001	7.048e+000	2.215e+000	2.200e+001	7.100e+001
24	1.620e+001	1.494e+001	6.251e+000	2.032e+000	2.300e+001	7.300e+001
25	1.537e+001	1.461e+001	4.780e+000	1.929e+000	2.400e+001	7.500e+001
26	1.412e+001	1.351e+001	4.078e+000	1.771e+000	2.500e+001	7.700e+001
27	1.273e+001	1.232e+001	3.214e+000	1.596e+000	2.600e+001	7.900e+001
28	1.158e+001	1.121e+001	2.918e+000	1.454e+000	2.700e+001	8.100e+001
29	1.030e+001	1.003e+001	2.369e+000	1.293e+000	2.800e+001	8.300e+001
30	8.326e+000	8.113e+000	1.872e+000	1.045e+000	2.900e+001	8.500e+001
31	7.561e+000	7.462e+000	1.224e+000	9.496e-001	3.000e+001	8.600e+001
32	6.426e+000	6.290e+000	1.317e+000	8.064e-001	3.100e+001	8.900e+001
33	5.525e+000	5.410e+000	1.126e+000	6.935e-001	3.200e+001	9.100e+001
34	4.405e+000	4.377e+000	5.017e-001	5.527e-001	3.300e+001	9.300e+001
35	4.476e+000	4.376e+000	9.446e-001	5.618e-001	3.400e+001	9.400e+001
36	4.168e+000	4.095e+000	7.743e-001	5.228e-001	3.500e+001	9.700e+001
37	4.176e+000	4.168e+000	2.556e-001	5.243e-001	3.600e+001	9.800e+001
38	3.757e+000	3.720e+000	5.238e-001	4.714e-001	3.700e+001	1.010e+002
39	3.932e+000	3.904e+000	4.663e-001	4.936e-001	3.800e+001	1.020e+002
40	3.230e+000	3.215e+000	3.074e-001	4.052e-001	3.900e+001	1.050e+002
41	3.804e+000	3.794e+000	2.715e-001	4.777e-001	4.000e+001	1.070e+002
42	3.808e+000	3.804e+000	1.876e-001	4.786e-001	4.100e+001	1.080e+002
43	3.872e+000	3.842e+000	4.809e-001	4.862e-001	4.200e+001	1.100e+002
44	4.018e+000	4.013e+000	2.074e-001	5.047e-001	4.300e+001	1.120e+002
45	4.182e+000	4.181e+000	1.166e-001	5.250e-001	4.400e+001	1.140e+002
46	4.359e+000	4.337e+000	4.397e-001	5.477e-001	4.500e+001	1.160e+002
47	4.524e+000	4.486e+000	5.830e-001	5.679e-001	4.600e+001	1.180e+002
48	4.928e+000	4.878e+000	6.960e-001	6.190e-001	4.700e+001	1.200e+002
49	5.592e+000	5.551e+000	6.801e-001	7.024e-001	4.800e+001	1.220e+002
50	7.056e+000	6.983e+000	1.012e+000	8.862e-001	4.900e+001	1.240e+002

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NO.	ETA* POISE	ETA POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
51	7.970e+000	7.806e+000	1.609e+000	9.997e-001	5.000e+001	1.260e+002
52	1.009e+001	9.875e+000	2.057e+000	1.266e+000	5.100e+001	1.280e+002

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OF POOR QUALITY



SOLVENT ONLY
SCAN

ORIGINAL PAGE IS
OF POOR QUALITY

REMARKS:

SAMPLE: Solvent

SOLVENT: Unisol-d + 0.027%

DEC. LEVEL

AUTO ☐

(250)

(500)

(2)

(.05)

MANUAL

SWEEP TIME (SEC): 90

SWEEP WIDTH (Hz): 350

FILTER: 1 2 3 4 5 6 7 8

RF POWER LEVEL: 0.30

SWEEP OFFSET (Hz): 0

SPECTRUM AMPLITUDE: 3.0

INTEGRAL AMPLITUDE: 1

SPINNING RATE (RPS): 30

NORELL, INC.
LANDISVILLE, N.J. 08326
T60 Phone: (609) 697-0020

DATE: 3-21-86

OPERATOR: DGW

SPECTRUM NO. 1A of 7

solvent scan

TABLE OF CONTENTS

FABRIC TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

CCA-3 Fabric for NASA Lot# 4

<u>TEST</u>	<u>PAGE</u>
1a. Breaking Strength, WARP.....	1
1b. Breaking Strength, FILL.....	1
2a. Carbon Assay.....	1
2b. Hydrogen Assay.....	1
2c. Nitrogen Assay.....	1
3. Visual Inspection.....	1
4. Specific Gravity.....	1
5. pH.....	1
6. TGA.....	1
7a. Atomic Absorption.....	2
7b. Moisture Content.....	2
7c. Ash Content.....	2
8a. Filament diameter, WARP.....	2
8b. Filament diameter, FILL.....	2
9a. Thread Count, WARP.....	2
9b. Thread Count, FILL.....	2
10a. Areal weight.....	2
10b. Volatiles.....	2
10c. Weight Change on Acetone Wash.....	3

CHARTS

Visual Inspection.....	3A
TGA.....	6A



FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

CCA-3 Fabric for NASA Lot# 4

1a. Breaking Strength, lbs/in, WARP ASTM D1682	PICK CENTER PLAIN AVG.	<u>#4-1</u> 30 33 <u>40</u> 34.3
1b. Breaking Strength, lbs/in, FILL ASTM D1682	PICK CENTER PLAIN AVG.	23 21 <u>26</u> 23.3
2a. Carbon Assay, % MDQAI 5560	PICK CENTER PLAIN AVG.	95.9 96.4 <u>96.3</u> 96.20
2b. Hydrogen Assay, % MDQAI 5560	PICK CENTER PLAIN AVG.	.16 .14 <u>.14</u> .147
2c. Nitrogen Assay, % MDQAI 5560	PICK CENTER PLAIN AVG.	.6 .6 <u>.6</u> .60
3. Visual Inspection QC1-102	See Charts 3A	
4. Specific Gravity, Units PTM-84		2.9670 2.8614 <u>3.0037</u> AVG. 2.944
(NOTE: Results are not reliable due to surface activity)		
5. pH, Units CTM-24B		7.7 <u>7.7</u> AVG. 7.70
6. TGA, °C at 50% Weight Loss CTM-51 (AIR)	SET UP #2 #4-1 586	

See Chart 6A

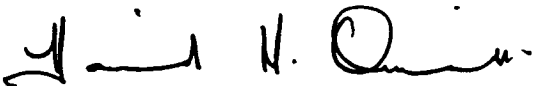
CCA-3 Fabric for NASA Lot# 4

7a. Atomic Absorption, ppm		<u>#4-1</u>
CTM-53B		
	Na	820
	K	50
	Ca	6
	Mg	52
	Li	<u>0</u>
	AVG.	928
7b. Moisture Content, %		6.298
CTM-53B		
7c. Ash Content, %		.312
CTM-53B		
8a. Filament diameter, microns, WARP		<u>#4-1</u>
S.E.M. procedure		AVERAGE 10.29
(diameters are an average		Minimum 9.05
10 measurements)		Maximum 14.70
		Std. Dev 1.65
8b. Filament diameter, microns, FILL		<u>#4-1</u>
S.E.M. procedure		AVERAGE 12.35
(diameters are an average		Minimum 11.25
of 10 measurements)		Maximum 13.10
		Std. Dev 0.60
9a. Thread Count, per inch, WARP		<u>#4-1</u>
PTM-5A		52
		54
		54
		53
		<u>53</u>
AVG.		53.2
9b. Thread Count, per inch, FILL		
PTM-5A		48
		49
		49
		49
		<u>49</u>
AVG.		48.8
10a. Areal weight as received, gm/4x4		
PTM-3A		
	LEFT	3.084
	CENTER	3.034
	RIGHT	<u>3.092</u>
	AVG.	3.070
10b. Volatiles as received, %		
PTM-3A		
	LEFT	6.91
	CENTER	6.62
	RIGHT	<u>6.76</u>
	AVG.	6.76

CCA-3 Fabric for NASA Lot# 4

10c. Weight Change on Acetone Wash, %		<u>#4-1</u>
PTM-3A	LEFT	-.17
	CENTER	.74
	RIGHT	<u>-.59</u>
	AVG.	-.01

U.S. Polymeric


Hamid M. Quraishi, Manager
Quality Assurance Department

Footage

DATE 6/6/86

FT	START	Sample
10		
20		
30		
40		
50		
60		
70		
80		
90		
100		
110		
120		
130		
140		
150		
160		
170		
180		
190		
200		
210		
220		
230		
240		
250		

LEFT

FABRIC OCA 3-43

MFG. HITE

ROLL NO. 18616

YARDS 30

POUNDS 18

ORDER NO. 71108

SPECIFICATION STW4 3184SEN2

Q.C. FILE # NASA 4-1

SYMBOLS



- TEAR



- SPOTS OR STAINS



- FOLDS



- EDGE CURL



- TIGHT WEAVE OR SELVAGE



- WEAVE DISTORTION



- VISIBLE PUCKERS



- ONE PUCKER CREASING



- TWO OR MORE CREASINGS

TREATMENT OPERATOR READ UP

REMARKS

NASA LOT# 4-1

START ONLY

GRADE Group A

GARCIA

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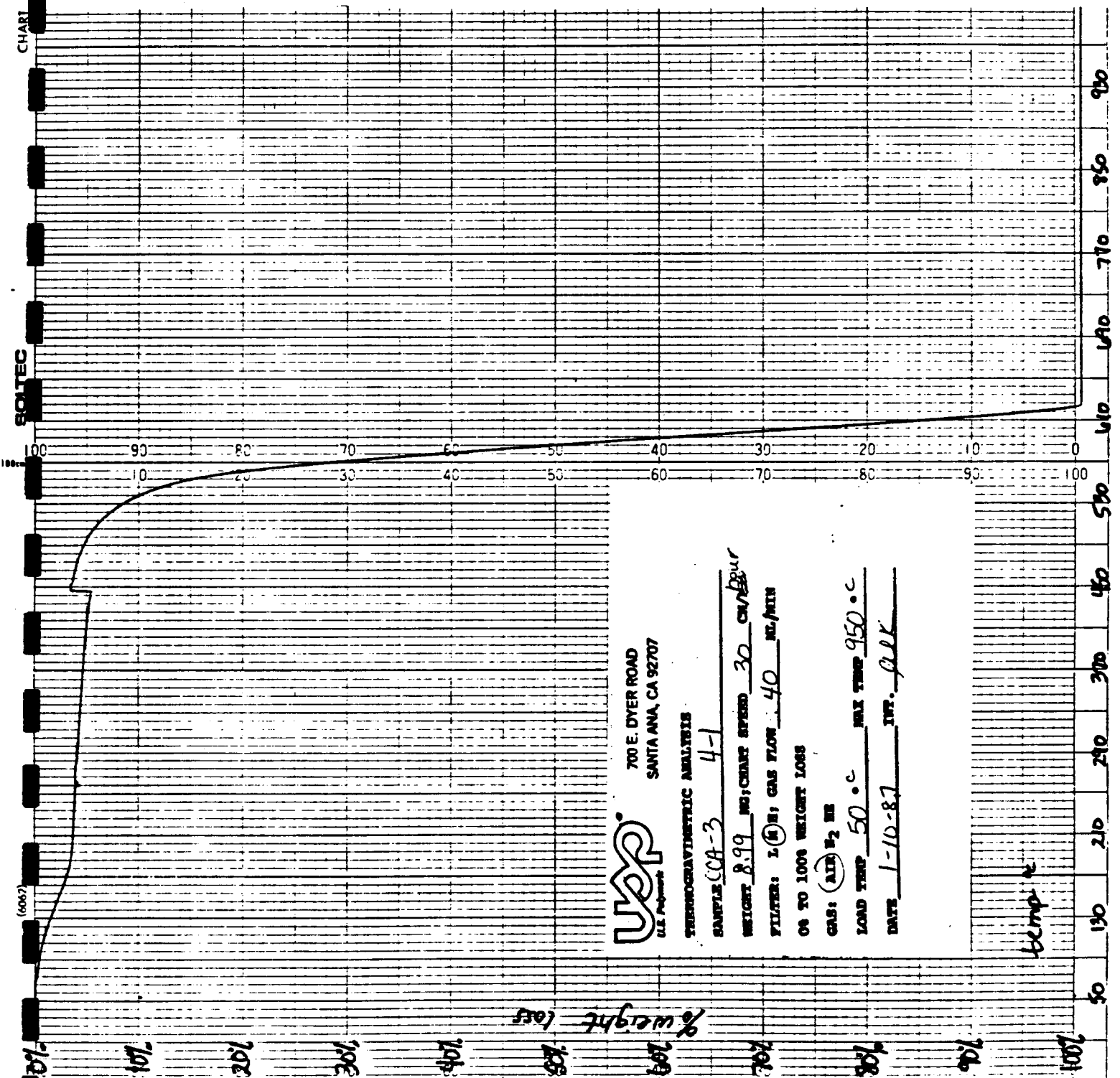


TABLE OF CONTENTS

PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5055B NASA LOT# 4 U.S.P. LOT# D09313

<u>TEST</u>	<u>PAGE</u>
1a. Resin Content, Soxhlet.....	1
1b. Filler Content, Soxhlet.....	1
1c. Cloth Content, Soxhlet.....	1
2. Volatile Content.....	1
3. Flow.....	1
4. Resin Content, Dry Basis.....	1
5. Tack.....	1
6. Gel Time.....	1
7a. Atomic Absorption.....	2
7b. Moisture Content.....	2
7c. Ash Content.....	2
8. TGA.....	2
9. DSC.....	2
10. Infrared (IRZB) Baseline.....	2
11. Environmental History.....	2
12. Specific Gravity.....	2
13a. Tensile Strength.....	2
13b. Tensile Modulus.....	3
13c. Tensile Elongation.....	3
14a. Flexural Strength.....	3
14b. Flexural Modulus.....	3
15a. Compressive Strength.....	3
15b. Compressive Modulus.....	3
16. Double Shear Strength.....	4
17. Barcol Hardness.....	4
18. Residual Volatiles.....	4
19. Resin Content, Pyrolysis.....	4
20. Acetone Extraction.....	4
21a. CTE, with ply.....	4
21b. CTE, crossply.....	4

CHARTS

TGA.....	8A - 8B
DSC.....	9A - 9B
Infrared (IRZB) Baseline.....	10A - 10B
CTE	21A - 21B



PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5055B NASA LOT# 4 U.S.P. LOT# D09313

1a. Resin Content, Soxhlet, % CTM-6D	<u>ROLL#1-S</u> 32.2 33.4 <u>33.3</u> AVG. 33.3 NASA LOT# 4 AVERAGE	<u>ROLL#2-S</u> 34.7 33.2 <u>35.8</u> 34.6 33.9
1b. Filler Content, Soxhlet, % CTM-6D	14.2 14.7 <u>15.1</u> AVG. 14.7 NASA LOT# 4 AVERAGE	15.3 14.6 <u>15.8</u> 15.2 15.0
1c. Cloth Content, Soxhlet, % CTM-6D	53.6 51.9 <u>50.6</u> AVG. 52.0 NASA LOT# 4 AVERAGE	50.0 52.2 <u>48.4</u> 50.2 51.1
2. Volatile Content, % PTM-17B	4.1 4.1 <u>4.7</u> AVG. 4.3 NASA LOT# 4 AVERAGE	4.1 4.4 <u>4.9</u> 4.5 4.4
3. Flow, % PTM-19G	13.5 13.1 <u>13.7</u> AVG. 13.4 NASA LOT# 4 AVERAGE	19.0 22.4 <u>21.7</u> 21.0 17.2
4. Resin Content, Dry basis, % PTM-16F, Type II	35.2 34.7 <u>36.5</u> AVG. 35.5 NASA LOT# 4 AVERAGE	33.7 33.9 <u>36.4</u> 34.7 35.1
5. Tack, lbs PTM-80	25 NASA LOT# 4 AVERAGE	32 29
6. Gel Time, seconds PTM-20E	64 NASA LOT# 4 AVERAGE	63 64

FM 5055B NASA LOT# 4 U.S.P. LOT# D09313

7a. Atomic Absorption, ppm		<u>ROLL#1-S</u>	<u>ROLL#2-S</u>	<u>LOT#4 AVG.</u>
CTM-53B	Na	353	334	344
	K	18	13	16
	Ca	7	9	8
	Mg	4	5	5
	Li	<u>0</u>	<u>0</u>	<u>0</u>
	TOTAL	382	361	372

7b. Moisture Content, %		<u>ROLL#1-S</u>	<u>ROLL#2-S</u>
CTM-53B		5.17	5.28
	NASA LOT# 4 AVERAGE	5.23	

7c. Ash Content, %		.15	.18
CTM-53B			
	NASA LOT# 4 AVERAGE	.17	

8. TGA, % Weight Loss at 500°C		9.7	10.3
CTM-51 (Nitrogen)			
	NASA LOT# 4 AVERAGE	10.0	

See chart 8A-8B

9. DSC, °C		<u>ROLL#1-S</u>	<u>ROLL#2-S</u>	<u>LOT#4 AVG.</u>
CTM-50A	First Temp	179	179	179
	Second Temp	237	237	237

See Chart 9A-9B

10. Infrared (IRZB) Baseline		1.12	1.11	1.12
CTM-21C				

See Chart 10A-10B

11. Environmental History	Date manufactured: 30 June 1986
	Packaged in: Polyethylene bag
	Date shipped: Test lot not shipped

12. Specific Gravity, Cured, Units		<u>ROLL#1-S</u>	<u>ROLL#2-S</u>
ASTM D792		1.482	1.475
		1.461	1.411
		<u>1.485</u>	<u>1.474</u>
	AVG.	1.476	1.453
	NASA LOT# 4 AVERAGE	1.464	

13a. Tensile Strength, ksi, WARP		19.18	18.46
FTMS 406-1011		16.85	19.00
		18.00	20.00
		17.94	17.10
		<u>18.01</u>	<u>19.14</u>
	AVG.	18.00	18.74
	NASA LOT# 4 AVERAGE	18.37	

FM 5055B NASA LOT# 4 U.S.P. LOT# D09313

13b. Tensile Modulus, ksi, WARP	<u>ROLL#1-S</u>	<u>ROLL#2-S</u>
FTMS 406-1011	2.83	2.95
	2.70	2.82
	2.78	3.10
	2.89	2.76
	<u>2.86</u>	<u>2.88</u>
AVG.	2.81	2.90
NASA LOT# 4 AVERAGE	2.86	
13c. Tensile Elongation, %, WARP	.98	.90
FTMS 406-1011	.92	.99
	.93	1.00
	.91	.88
	<u>.92</u>	<u>.91</u>
AVG.	.93	.94
NASA LOT# 4 AVERAGE	.93	
14a. Flexural Strength, ksi, WARP	30.91	28.37
FTMS 406-1031	29.85	30.37
	27.95	29.32
	29.30	30.52
	<u>37.66</u>	<u>29.87</u>
AVG.	31.13	29.69
NASA LOT# 4 AVERAGE	30.41	
14b. Flexural Modulus, ksi, WARP	2.85	2.76
FTMS 406-1031	2.77	2.89
	2.86	2.99
	2.73	2.93
	<u>2.77</u>	<u>2.70</u>
AVG.	2.80	2.85
NASA LOT# 4 AVERAGE	2.83	
15a. Compressive Strength, ksi, WARP	52.73	55.77
FTMS 406-1021	53.10	53.90
	52.91	36.50
	58.21	55.93
	<u>57.99</u>	<u>57.91</u>
AVG.	54.99	52.00
NASA LOT# 4 AVERAGE	53.49	
15b. Compressive Modulus, ksi, WARP	3.37	2.64
FTMS 406-1021	2.83	2.68
	2.88	2.90
	2.83	2.78
	<u>2.85</u>	<u>2.70</u>
AVG.	2.95	2.74
NASA LOT# 4 AVERAGE	2.85	

FM 5055B NASA LOT# 4 U.S.P. LOT# D09313

	<u>ROLL#1-S</u>	<u>ROLL#2-S</u>
16. Double Shear Strength, ksi FTMS 406-1041A	4.58	4.42
	4.74	4.11
	4.48	4.57
	4.65	3.84
	<u>4.86</u>	<u>3.92</u>
AVG.	4.66	4.17
NASA LOT# 4 AVERAGE	4.42	
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)	72.5	71.3
NASA LOT# 4 AVERAGE	71.9	
18. Residual Volatiles, % PTM-98	1.32	1.58
	1.33	1.54
	<u>1.34</u>	<u>1.57</u>
AVG.	1.33	1.56
NASA LOT# 4 AVERAGE	1.45	
19. Resin Content, Pyrolysis, % CTM-14B	33.86	35.63
	34.00	35.22
	<u>33.96</u>	<u>35.06</u>
AVG.	33.94	35.30
NASA LOT# 4 AVERAGE	34.62	
20. Acetone Extraction, % CTM-18A	.65	.60
	.47	1.41
	<u>.57</u>	<u>1.75</u>
AVG.	.57	1.25
NASA LOT# 4 AVERAGE	.91	
21a. CTE, in/in °F with PLY PTM-61B	3.86	3.62
	<u>3.98</u>	<u>4.61</u>
AVG.	3.92	4.12
NASA LOT# 4 AVERAGE	4.02	
21b. CTE, in/in °F Cross PLY PTM-61B	5.47	8.17
	<u>6.67</u>	<u>5.68</u>
AVG.	6.07	6.93
NASA LOT# 4 AVERAGE	6.50	

See Chart 21A-21B

U.S. Polymeric


 Hamid M. Quraishi, Manager
 Quality Assurance Department

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700 E. DYER ROAD
SANTA ANA, CA 92707



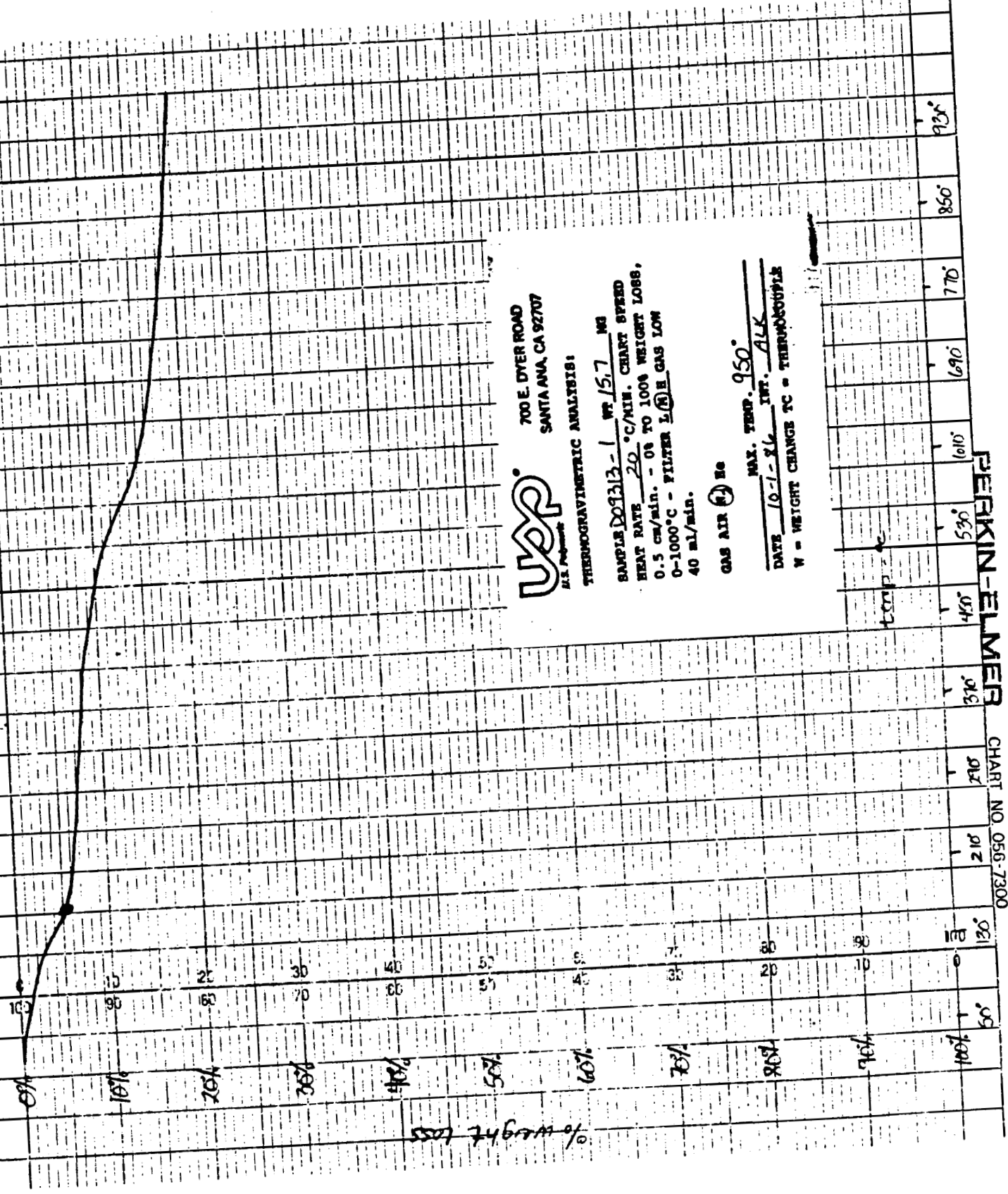
WAP
THERMOGRAVIMETRIC ANALYSIS

SAMPLE DO9313-1 WT 15.7 MG
HEAT RATE 20 °C/MIN. CHART SPEED
0.5 CM/MIN. - 0% TO 100% WEIGHT LOSS
0-1000°C - FILTER L(R) GAS FLOW
40 ml/min.

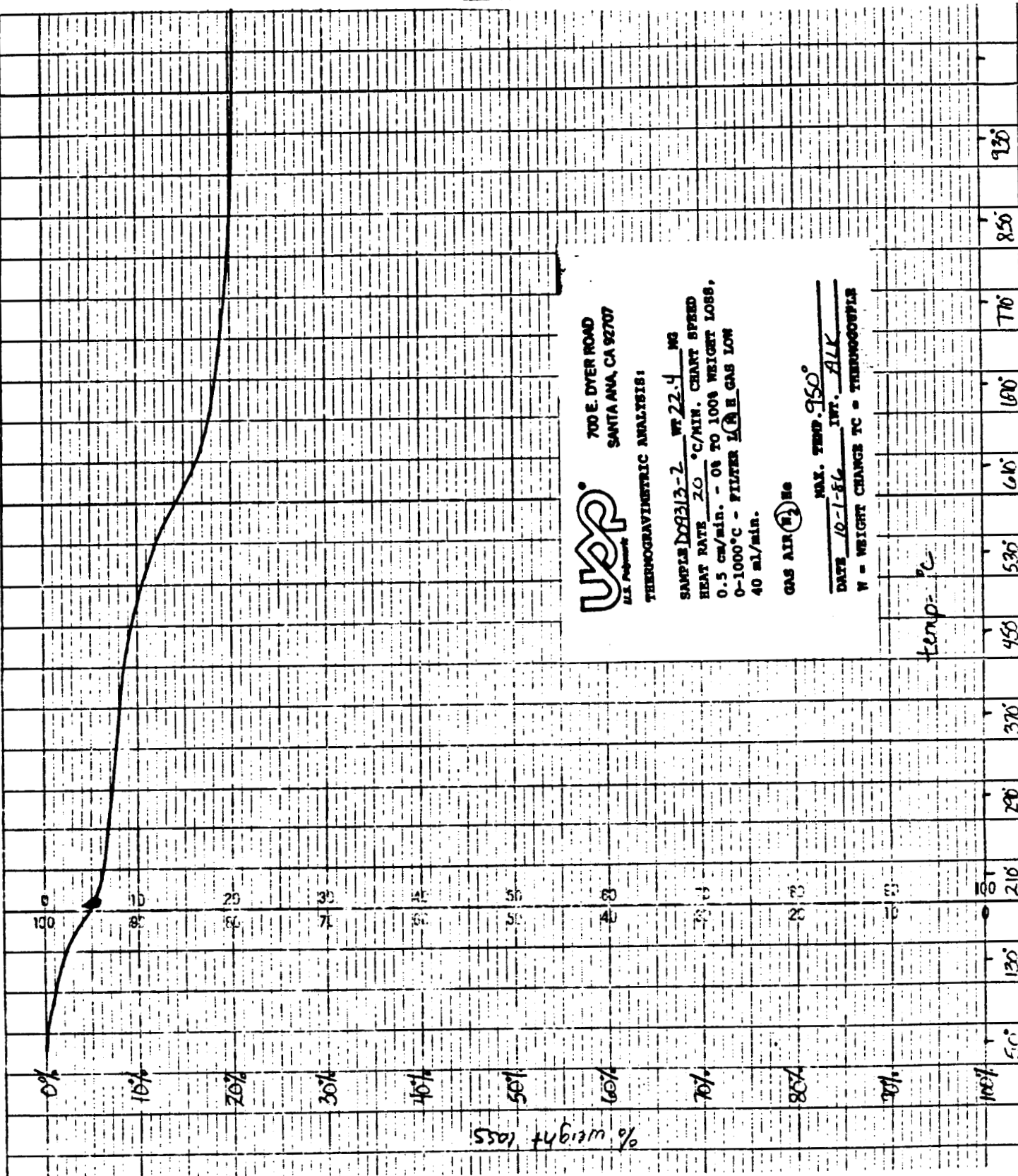
GAS AIR 21 He

MAX. TEMP. 950
DATE 10-1-86 INT. ALK
W = WEIGHT CHANGE TC = THERMOCOUPLE

PERKIN-ELMER
CHART NO. 056-7300



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UAP
ALL PURPOSE

700 E. DYER ROAD
SANTA ANA, CA 92707

THERMOGRAVIMETRIC ANALYSIS:

SAMPLE DO9313-2 WT 22.4 MG
HEAT RATE 20 °C/MIN. CHART SPEED
0.5 CM/MIN. - 0% TO 100% WEIGHT LOSS,
0-1000°C - FILTER 1 H GAS LOW
40 ml/min.

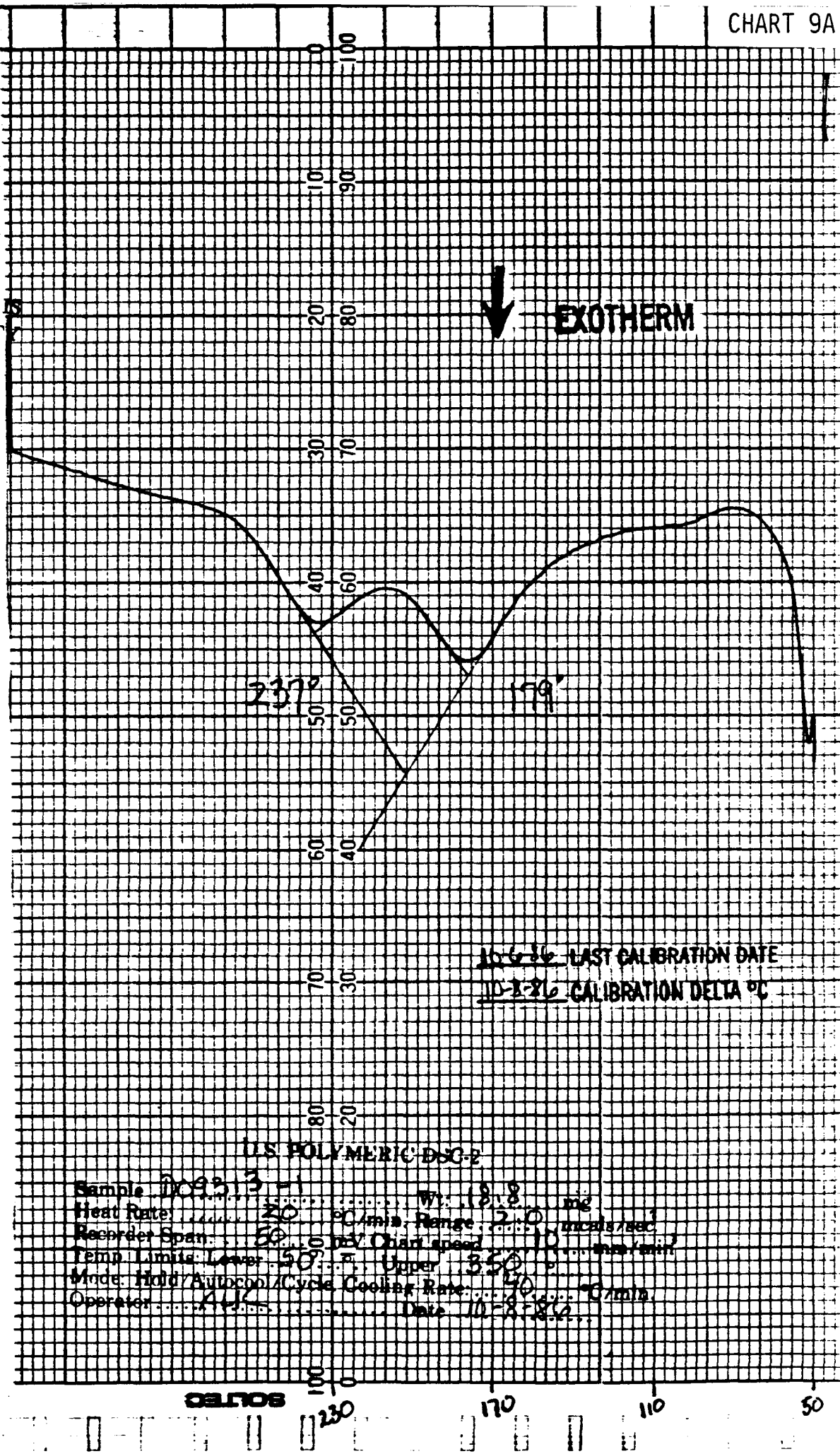
GAS AIR (N₂) He

MAX. TEMP. 930°
DATE 10-1-86 INT. ALK
W = WEIGHT CHANGE TC = THERMOCOUPLE

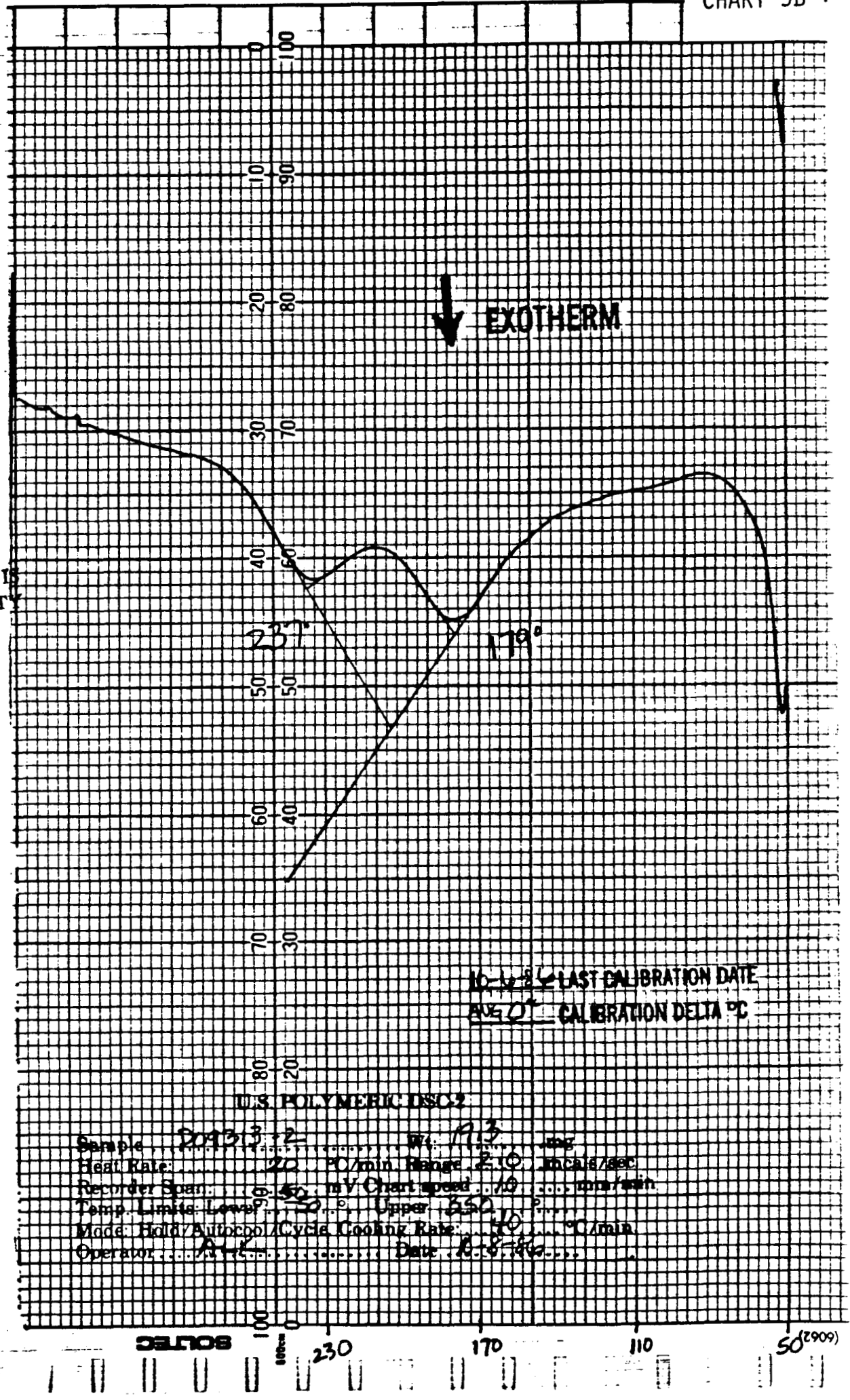
PERKIN-ELMER

CHART NO 056-7300

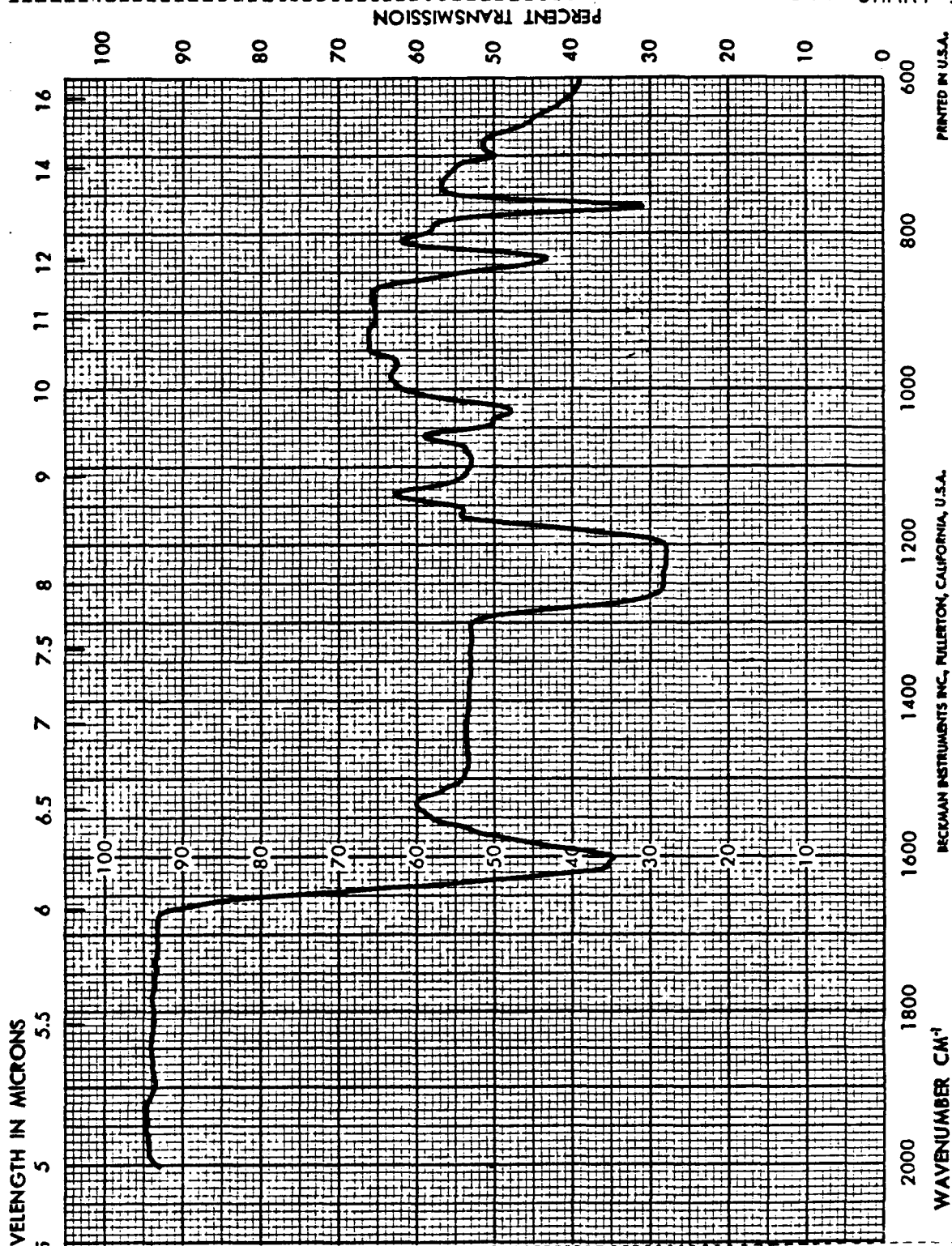
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SPECTRUM NO. 15179

DATE 7-03-86

SAMPLE FM 5055 B

D09313 #1

SOURCE _____

STRUCTURE _____

PATH 0.2 mm NaCl

SOLVENT ACETONE

CONCENTRATION 80-50%

PHASE 3

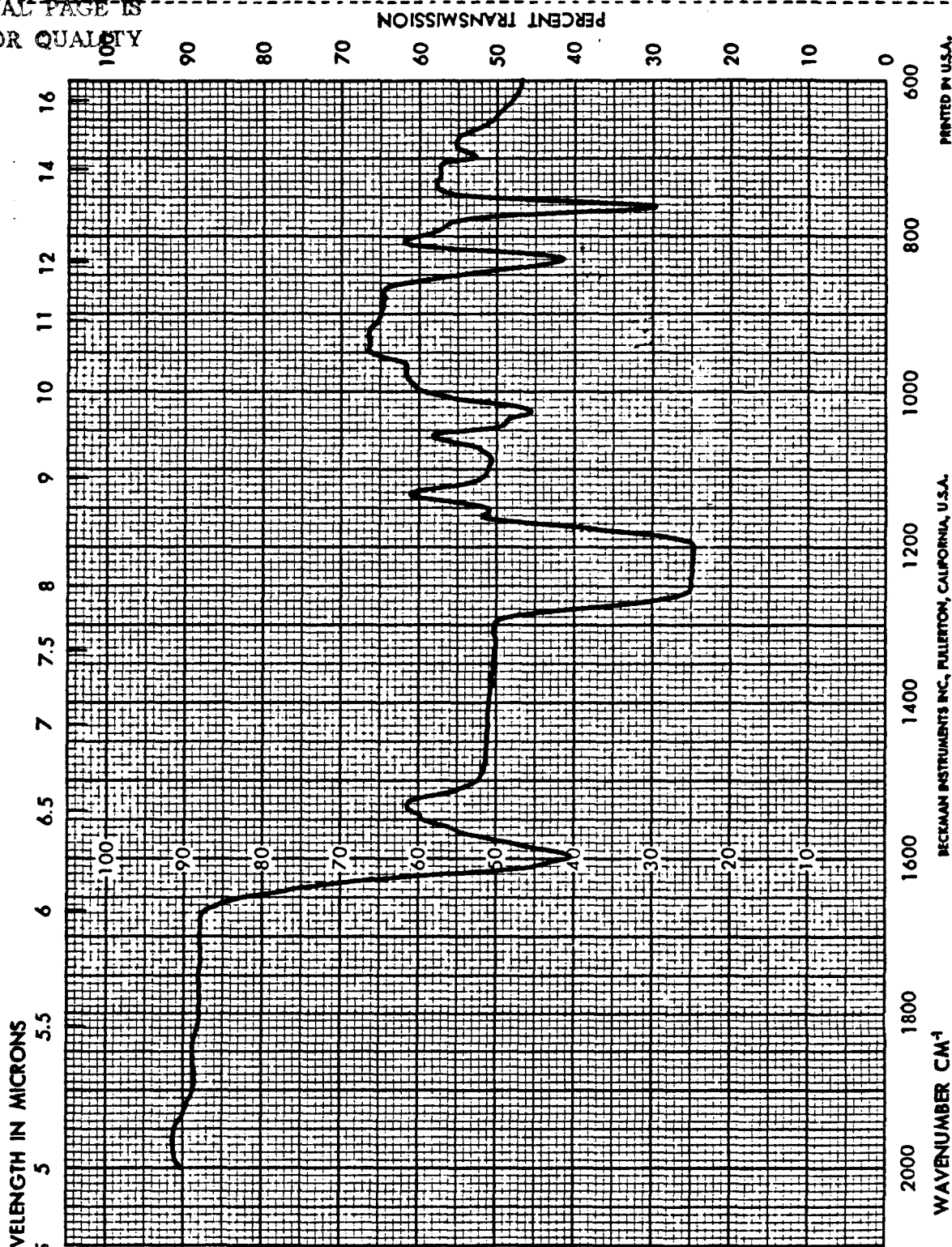
COMMENTS PREPARED

MATERIAL

ANALYST V. MIRANDA

Beckman®

INFRARED
SPECTROPHOTOMETER

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BECKMAN INSTRUMENTS INC., FULLERTON, CALIFORNIA, U.S.A.

WAVENUMBER CM⁻¹

PRINTED IN U.S.A.

SPECTRUM NO. 15180DATE 7-03-64SAMPLE FM 5055BD09313 # 2

SOURCE _____

STRUCTURE _____

PATH 0.2 mm NACLSOLVENT ACETONECONCENTRATION 30-50%PHASE 3COMMENTS PRE-PREGMATERIALANALYST V. MIRANDA**Beckman®**INFRARED
SPECTROPHOTOMETER

PART NO. 990088

RUN NO. <u>DATE 11/26/84</u> OPERATOR <u>DP</u> SAMPLE: <u>D09 317-1-(1)</u> ATM. <u>At</u> @ <u>508</u> FLOW RATE <u>3.5X10⁴</u>		T-AXIS SCALE, °C/in. <u>20</u> PROG. RATE, °C/min <u>10</u> HEAT / COOL <u>ISO</u> SHIFT, in. <u>0</u>		DTA-DSC SCALE, °C/in. <u>20</u> (mcal/sec)/in. WEIGHT, mg REFERENCE		TGA SCALE, mg/in. SUPPRESSION, mg WEIGHT, mg TIME CONST., sec dY, (mg/min)/in.		TMA (in/in/°F) SCALE, mils/in. <u>0.1/0.2</u> MODE <u>EXPANSION</u> SAMPLE SIZE <u>0.254</u> LOAD, g <u>10</u> dY, (10X), (mils/min)/in.	
--	--	---	--	--	--	--	--	--	--

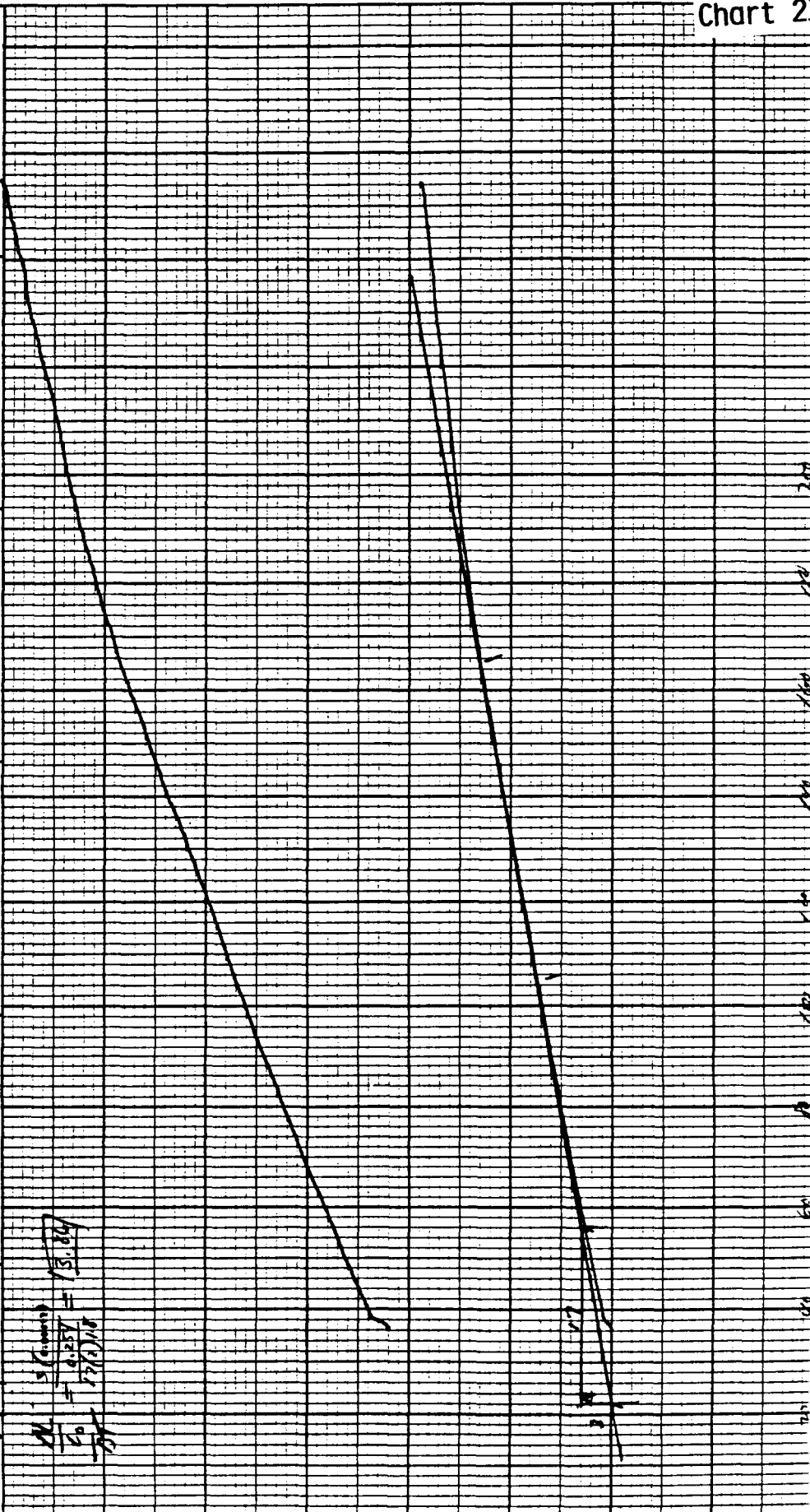


Chart 21A1

DU PONT Instruments

MEASURED VARIABLE

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PART NO. 990088

RUN NO. <u>DATE 11/16/76</u> OPERATOR <u>DP</u> SAMPLE: <u>D09313-1-62</u> ATM. <u>At</u> <u>0.500</u> FLOW RATE <u>2.500 L</u> <u>WPLY</u>	T-AXIS SCALE, °C/in. <u>20</u> PROG. RATE, °C/min. <u>10</u> HEAT <input checked="" type="checkbox"/> COOL <input type="checkbox"/> ISO <input type="checkbox"/> SHIFT, in. <u>0</u>	DTA-DSC SCALE, °C/in. _____ (mcal/sec)/in. _____ WEIGHT, mg _____ REFERENCE _____	TGA SCALE, mg/in. _____ SUPPRESSION, mg _____ WEIGHT, mg _____ TIME CONST., sec _____ dY, (mg/min)/in. _____	TMA <u>(mic/in)</u> SCALE, mils/in. <u>0.10.2</u> MODE <u>DIFFERENTIAL</u> SAMPLE SIZE <u>0.25g</u> LOAD, g <u>10</u> dY, (10X), (mils/min)/in. _____
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$$\frac{dL}{dt} = \frac{2.500}{17(2)10.2} = 1.570$$

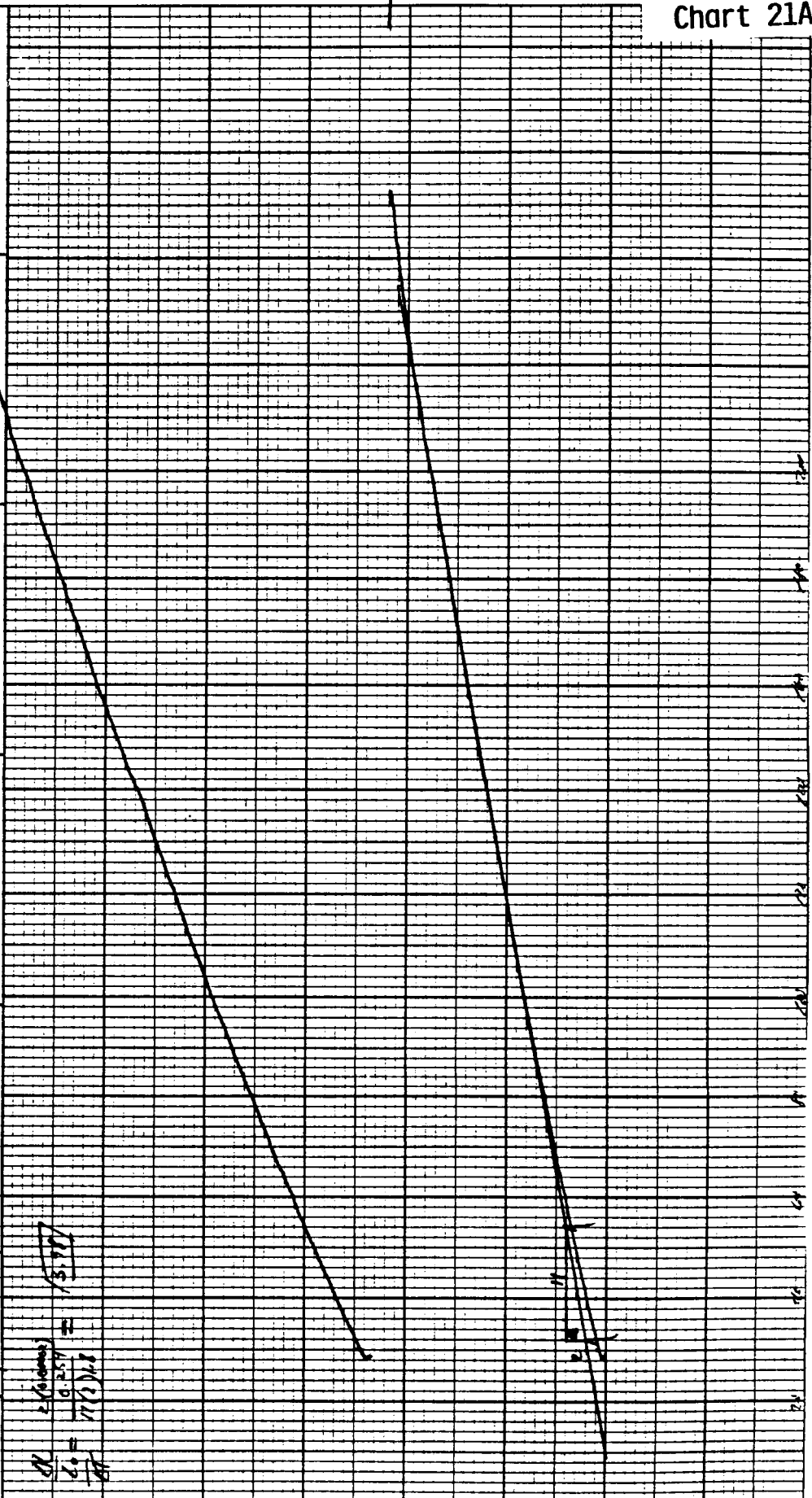


Chart 21A2

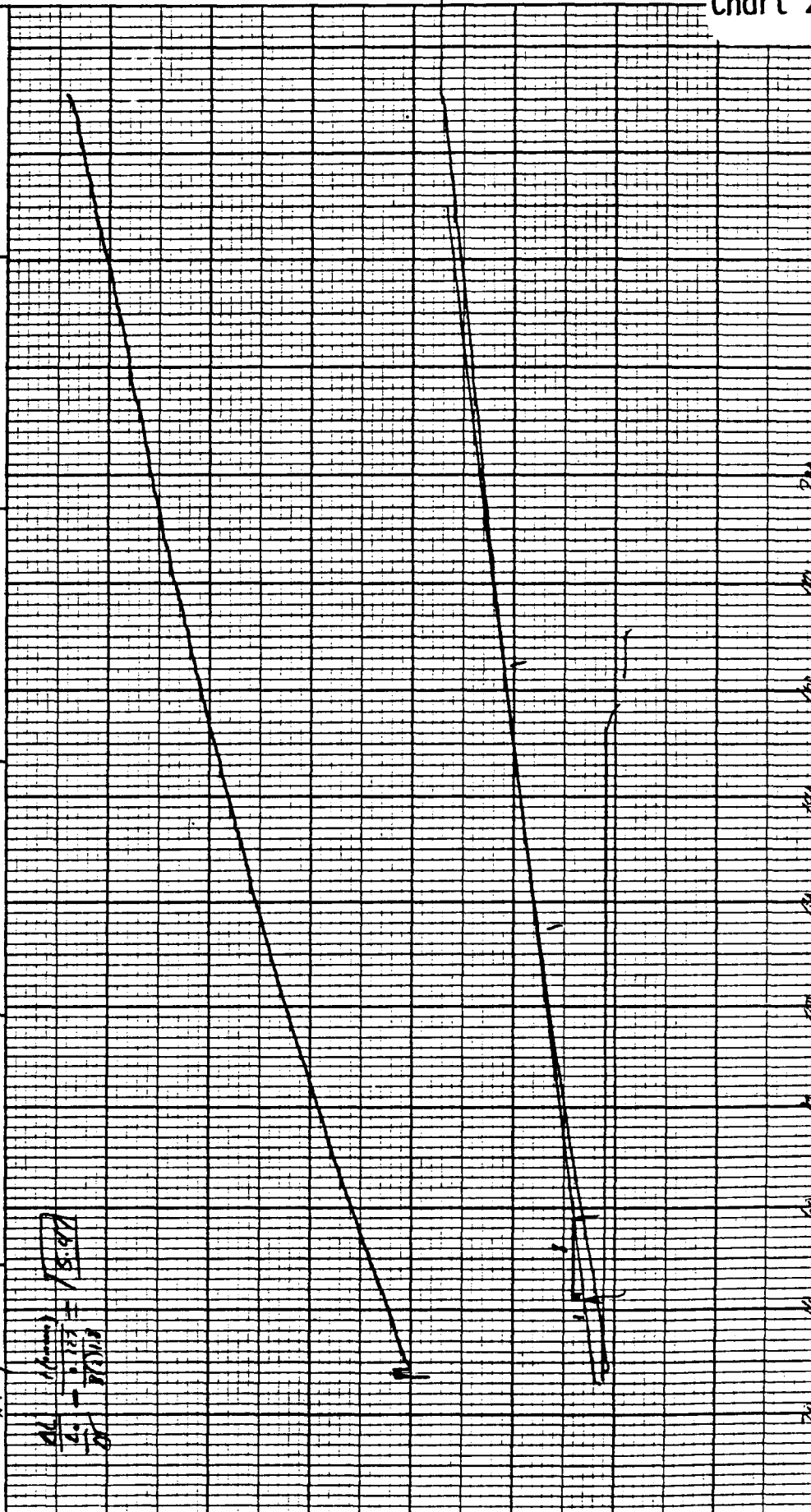
DU PONT Instruments

MEASURED VARIABLE

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PART NO. 990088 -

RUN NO. <u>12/1/16</u> OPERATOR <u>DP</u> SAMPLE <u>DG 313-1-(3)</u> ATM <u>At</u> @ <u>500</u> FLOW RATE <u>3.5 GCV</u> <u>XPLY</u>	T-AXIS SCALE, °C/in. <u>20</u> PROG. RATE, °C/min. <u>10</u> HEAT, COOL, ISO <u>ISO</u> SHIFT, in. <u>0</u>	DTA-DSC SCALE, °C/in. <u>20</u> (mcal/sec)/in. WEIGHT, mg REFERENCE	TGA SCALE, mg/in. SUPPRESSION, mg WEIGHT, mg TIME CONST., sec dY, (mg/min)/in	TMA (µin/in·°C) SCALE, mile/in. <u>0.1/0.2</u> MODE <u>EXAMIN</u> SAMPLE SIZE <u>0.127</u> LOAD, g <u>70</u> dY, (10X), (mile/min)/in
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DU PONT Instruments

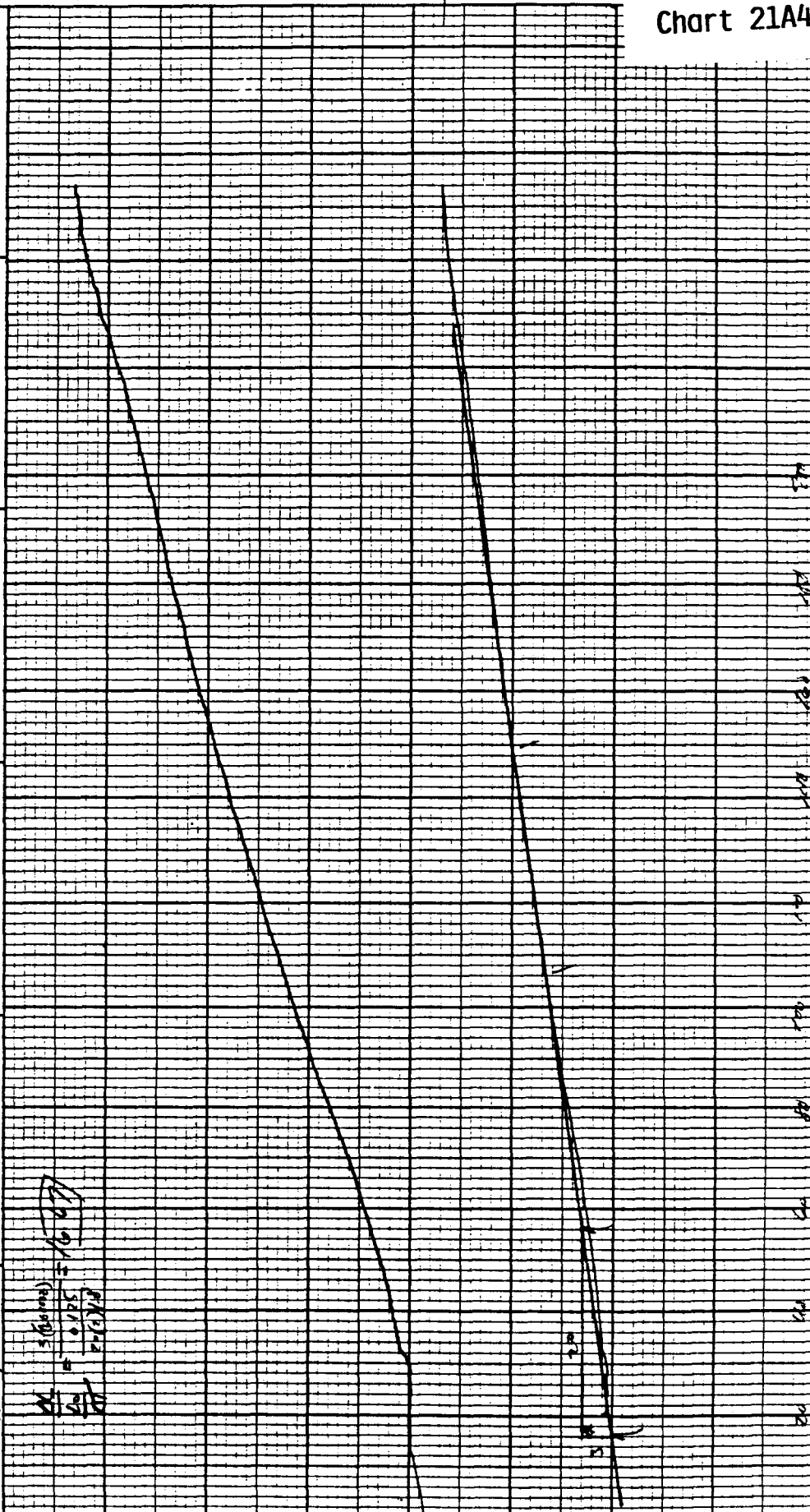
MEASURED VARIABLE

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PART NO. 990088

RUN NO. <u>DATE 1/1/76</u> OPERATOR <u>JD</u> SAMPLE: <u>D07315-1-(1)</u> ATM/At <u>@ 20</u> FLOW RATE <u>1500</u>	T-AXIS SCALE, °C/in <u>20</u> PROG. RATE, °C/min <u>20</u> HEAT <u>COOL</u> <u>ISO</u> SHIFT, in <u>0</u>	DTA-DSC SCALE, °C/in <u>20</u> (mcal/sec)/in WEIGHT, mg REFERENCE	TGA SCALE, mg/in SUPPRESSION, mg WEIGHT, mg TIME CONST., sec dY, (mg/min)/in	TMA <u>film (air)</u> SCALE, mils/in <u>0.1/10</u> MODE <u>ELASTIC</u> SAMPLE SIZE <u>0.125</u> LOAD, g <u>1</u> dY, (10X), (mils/min)/in
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DU PONT Instruments MEASURED VARIABLE

PART NO. 990088

RUN NO. 1120/K
 OPERATOR DL
 SAMPLE: D 0933-2(-)
 ATM At @ 50
 FLOW RATE 3.5 LPM
WPLY

T-AXIS
 SCALE, °C/in 50-24
 PROG. RATE, °C/min 4
 HEAT COOL ISO
 SHIFT, in 0

DTA-DSC
 SCALE, °C/in (mcal/sec)/in
 WEIGHT, mg
 REFERENCE

TGA
 SCALE, mg/in
 SUPPRESSION, mg
 WEIGHT, mg
 TIME CONST., sec
 dY, (mg/min)/in

TMA (µin/in)
 SCALE, mils/in 0.1/0.2
 MODE EXTENSIVE
 SAMPLE SIZE 0.256
 LOAD, g 1
 dY, (10X) (mils/min)/in

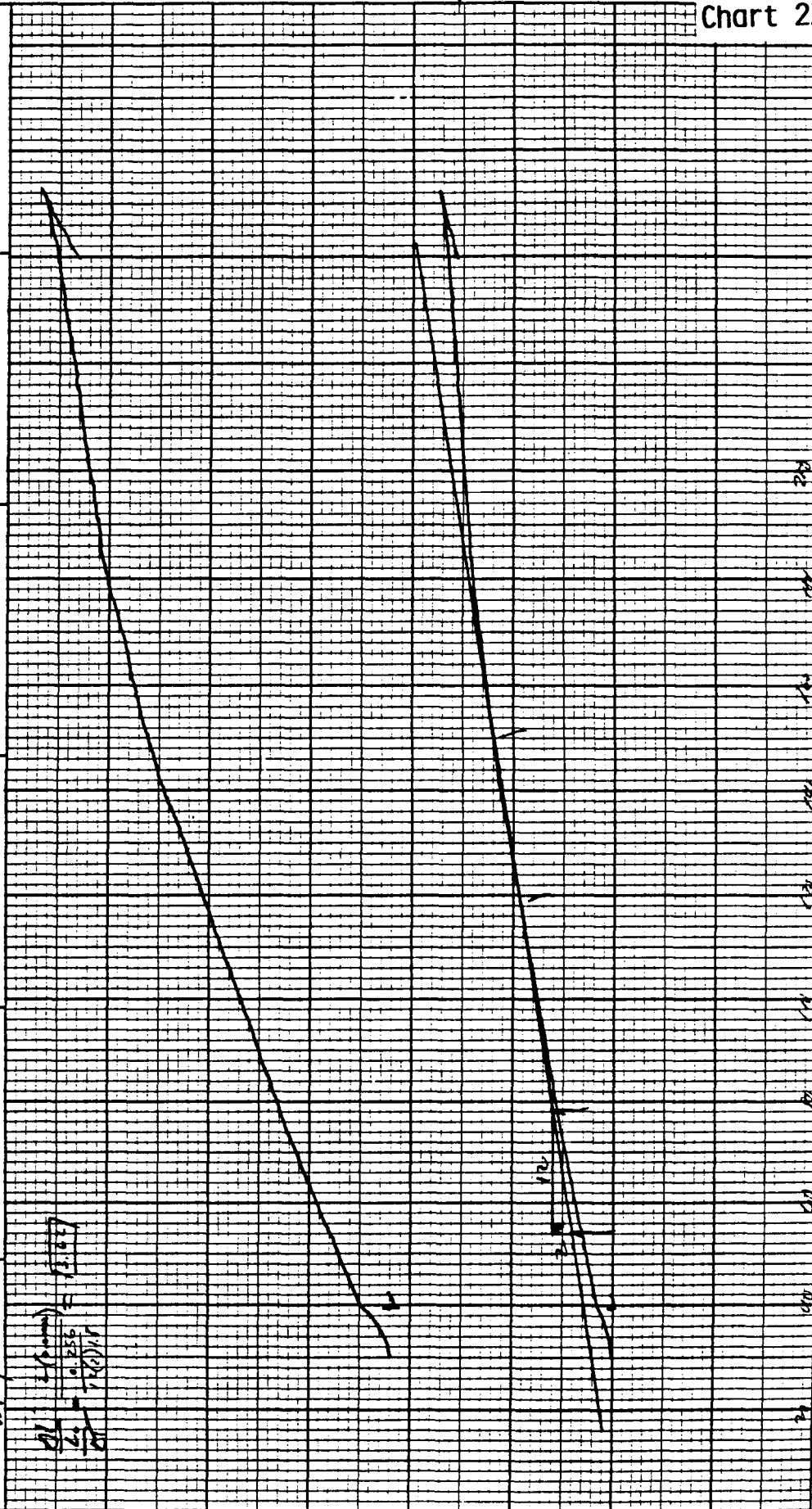


Chart 21B1

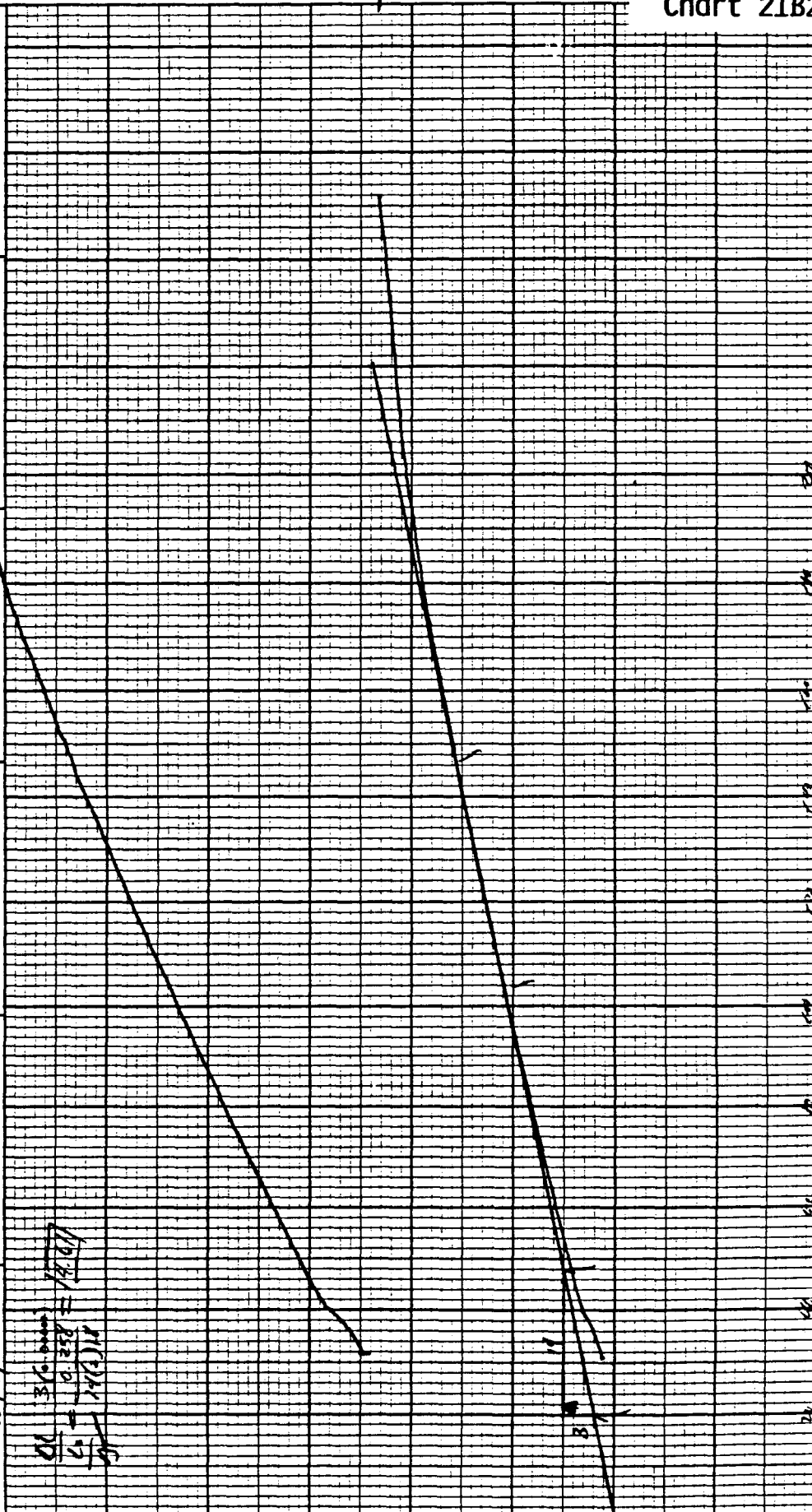
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MEASURED VARIABLE

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PART NO. 990088

RUN NO. _____ OPERATOR <u>TR</u> SAMPLE: <u>D01315-2-(2)</u> ATM. <u>44</u> @ <u>500</u> FLOW RATE <u>3.5</u> LPM <u>WPLY</u>	T-AXIS SCALE: °C/in. <u>50-20</u> PRDG. RATE: °C/min <u>0</u> HEAT <input checked="" type="checkbox"/> COOL <input type="checkbox"/> ISO <input type="checkbox"/> SHIFT: In <u>0</u>	DTA-DSC SCALE: °C/in. _____ (mcal/sec)/in. _____ WEIGHT, mg _____ REFERENCE _____	TGA SCALE, mg/in. _____ SUPPRESSION, mg _____ WEIGHT, mg _____ TIME CONST., sec _____ dY, (mg/min)/in. _____	TMA <u>(in/hr)</u> SCALE, mils/in. <u>0.1/62</u> MODE <u>EXTRUSION</u> SAMPLE SIZE <u>0.254</u> LOAD, g <u>0</u> dY <u>(100X)</u> (mils/min)/in. _____
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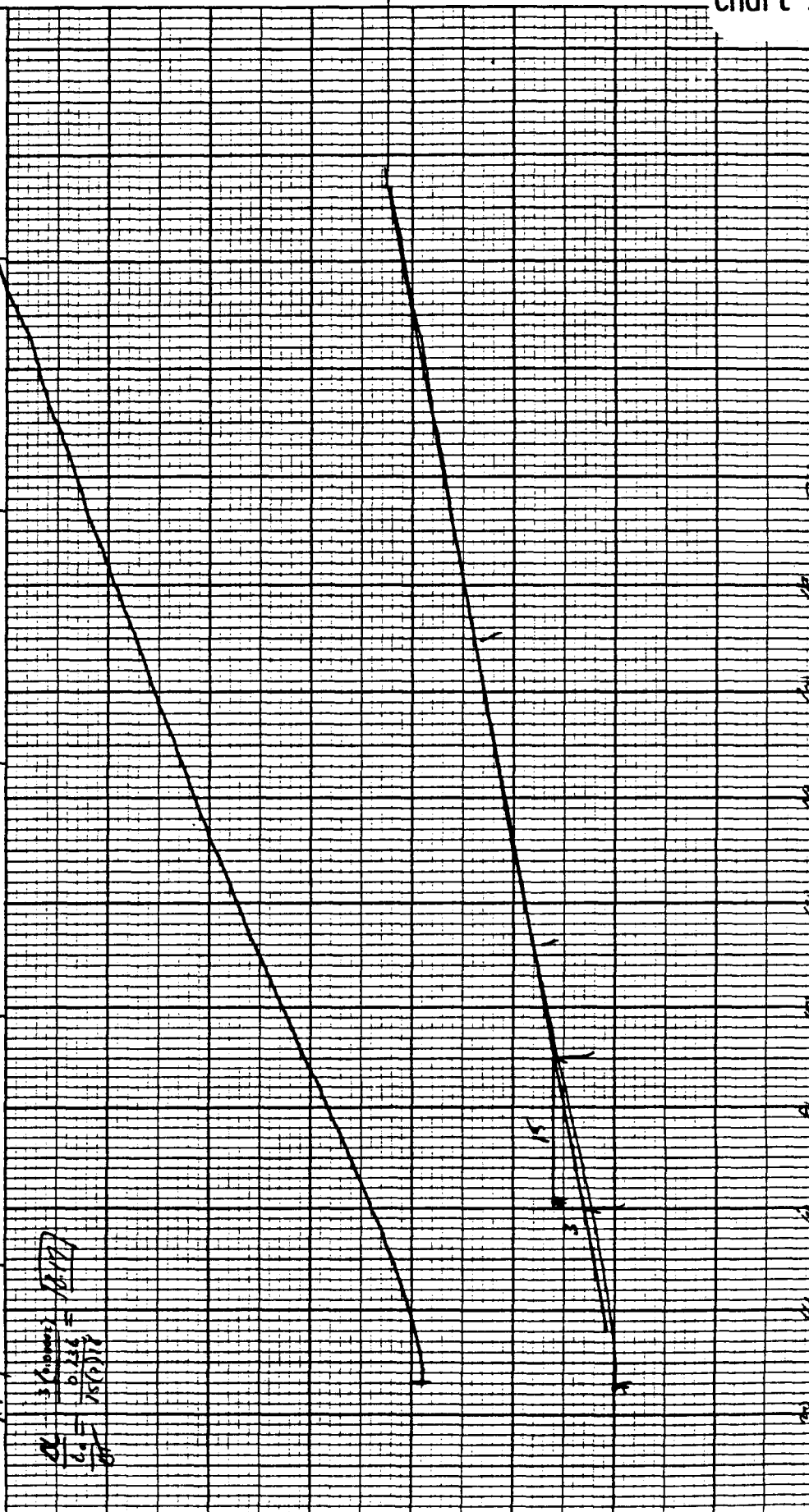
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MEASURED VARIABLE

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PART NO. 990088

RUN NO. <u>12116</u> OPERATOR <u>12</u> SAMPLE: <u>D0313-2-(3)</u> ATM. <u>46</u> @ <u>50"</u> FLOW RATE <u>3.5 L/min</u>	T-AXIS SCALE: °C/in. <u>50</u> PROG. RATE: °C/min <u>11</u> HEAT / COOL <u>ISO</u> SHIFT: in <u>0</u>	DTA-DSC SCALE: °C/in. <u>(mcal/sec)/in.</u> WEIGHT, mg <u></u> REFERENCE <u></u>	TGA SCALE, mg/in. <u></u> SUPPRESSION, mg <u></u> WEIGHT, mg <u></u> TIME CONST., sec <u></u> dY, (mg/min) / in <u></u>	TMA <u>(in/in/°F)</u> SCALE, mils/in. <u>0.1/0.2</u> MODE <u>EXTENSIONAL</u> SAMPLE SIZE <u>0.136</u> LOAD, g <u>10</u> dY, (10X), (mils/min) / in <u></u>
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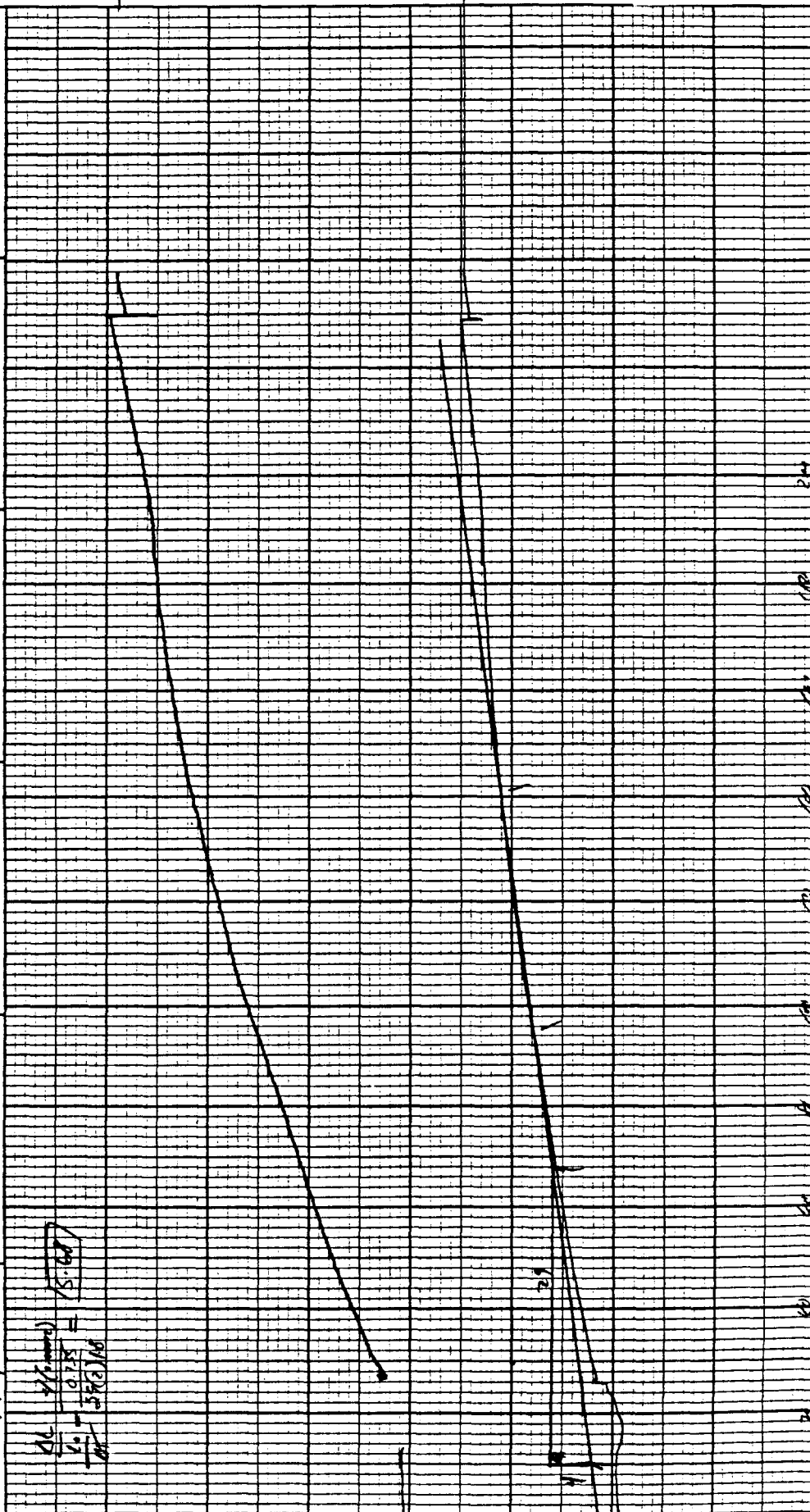


MEASURED VARIABLE

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PART NO. 990088

RUN NO. <u>116</u> OPERATOR <u>ST</u> SAMPLE <u>D0933-2 (d)</u> ATM <u>Ar</u> @ <u>50</u> FLOW RATE <u>3.5</u> L/min <u>XP24</u>	T-AXIS SCALE, °C/in. <u>50</u> PROG. RATE, °C/min <u>10</u> HEAT <input checked="" type="checkbox"/> COOL <u>150</u> SHIFT, in. <u>0</u>	DTA-DSC SCALE, °C/in. <u>10</u> (mcal/sec)/in. WEIGHT, mg REFERENCE	TGA SCALE, mg/in. SUPPRESSION, mg WEIGHT, mg TIME CONST., sec dY, (mg/min)/in.	TMA (in./in. ²) SCALE, mils/in. <u>0.1</u> MODE <u>EXTRA</u> SAMPLE SIZE <u>0.15</u> LOAD, g <u>10</u> dY, (10X), (mils/min)/in.
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DU PONT Instruments

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FILLER TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

Filler Lot for NASA Lot# 5

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2. Ash Content.....	1
3. Atomic Absorption.....	1
3a. Moisture Content.....	1
3b. Ash Content.....	1
4. pH.....	1
5. Particle Size, S.E.M. procedure.....	1
6a. TGA, °C at 50% Loss.....	1
6b. TGA.....	2
7. Particle Size Distribution.....	2
7a. Particle Size, Horiba.....	2

CHARTS

TGA.....	6A - 6C
Particle Size Distribution.....	7A - 7C



FILLER TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 5

1. Carbon Content, % QAI-5560	<u>SAMPLE</u>			
	<u>#5A-1</u>	<u>#5A-2</u>	<u>#5A-3</u>	
	99.27	99.36	99.28	
	NASA LOT# 5	AVERAGE	99.30	
2. Ash Content, % PTM-71B	0.000	0.011	0.005	
	<u>0.000</u>	<u>0.005</u>	<u>0.020</u>	
	AVG. 0.000	0.008	0.012	
	NASA LOT# 5	AVERAGE	0.007	
3. Atomic Absorption, ppm CTM-53B (Values are average of 2 determinations)	#5A-1	#5A-2	#5A-3	LOT#5
				<u>AVG.</u>
	Na 18.5	18.0	19.0	18.5
	K 2.0	2.0	2.5	2.2
	Ca 2.0	2.0	2.0	2.0
	Mg 0.0	0.0	0.0	0.0
	Li <u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
	TOTAL 22.5	22.0	23.5	22.7
3a. Moisture Content, % CTM-53B	.010	.000	.000	
	<u>.021</u>	<u>.000</u>	<u>.000</u>	
	AVG. .016	.000	.000	
	NASA LOT# 5	AVERAGE	.005	
3b. Ash Content, % CTM-53B	0.000	0.010	0.025	
	<u>0.015</u>	<u>0.015</u>	<u>0.010</u>	
	AVG. 0.008	0.013	0.018	
	NASA LOT# 5	AVERAGE	0.013	
4. pH, Units ASTM D1512	5.25	5.55	5.55	
	<u>5.40</u>	<u>5.50</u>	<u>5.60</u>	
	AVG. 5.32	5.52	5.58	
	NASA LOT# 5	AVERAGE	5.47	
5. Particle Size, microns S.E.M. procedure (Average values are of 20 determinations)	AVG. .50	.45	.50	
	Maximum .99	.79	.88	
	Minimum .16	.20	.20	
	Std. Dev .27	.15	.19	
	NASA LOT# 5	AVERAGE SIZE	.48	
6a. TGA, °C at 50% Loss CTM-51	837	870	880	
	NASA LOT# 5	AVERAGE	862	

Filler Lot for NASA Lot# 5

6b. TGA
CTM-51

See Charts 6A-6C

7. Particle Size Distribution
CTM-72

See Charts 7A-7C

7a. Particle Size, microns
CTM-72

	<u>#5A-1</u>	<u>#5A-2</u>	<u>#5A-3</u>
	.90	.90	1.08
	<u>1.00</u>	<u>.88</u>	<u>.98</u>
AVG.	.95	.89	1.03
NASA LOT# 5	AVERAGE		.96

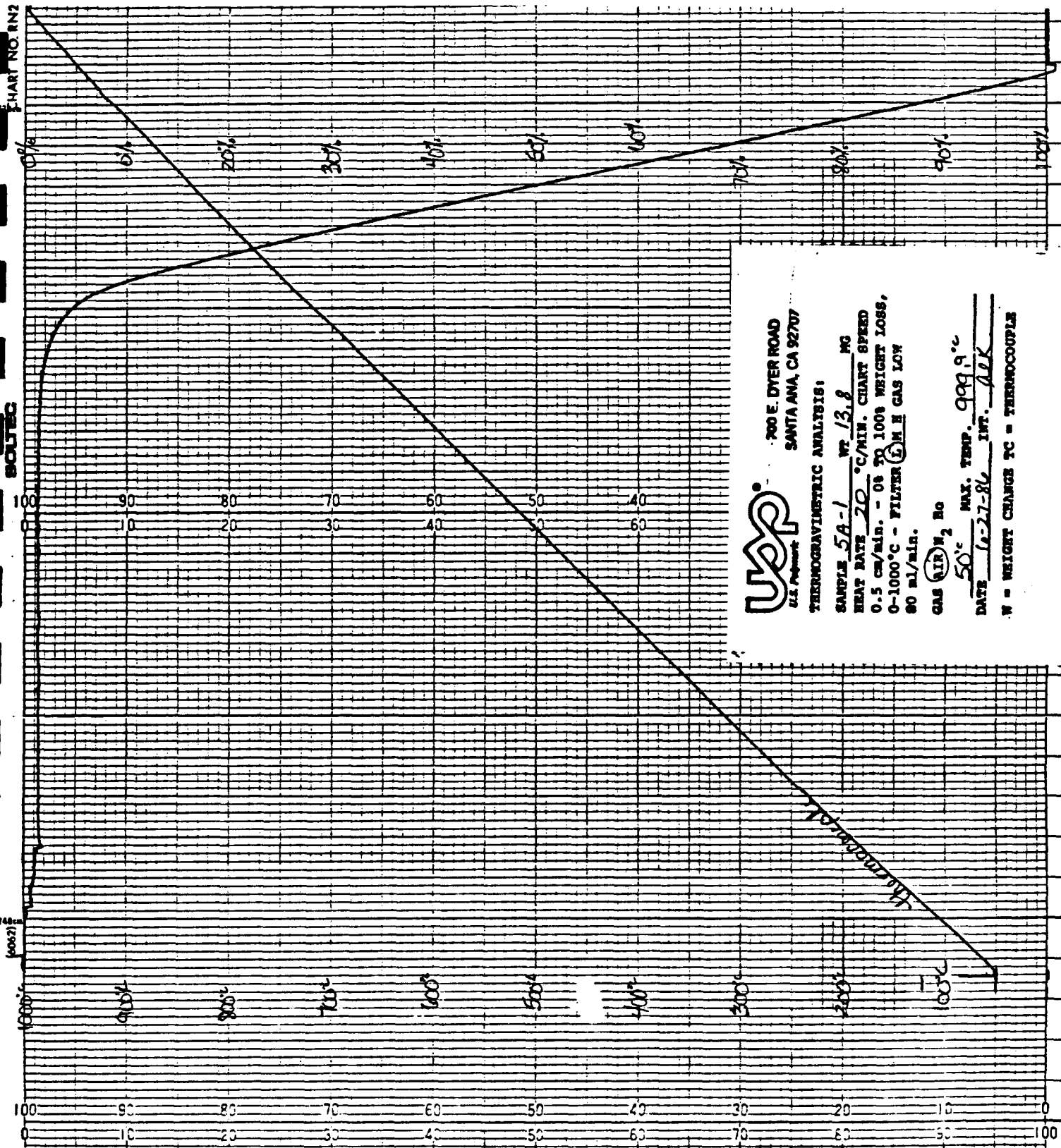
U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

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CHART 6A



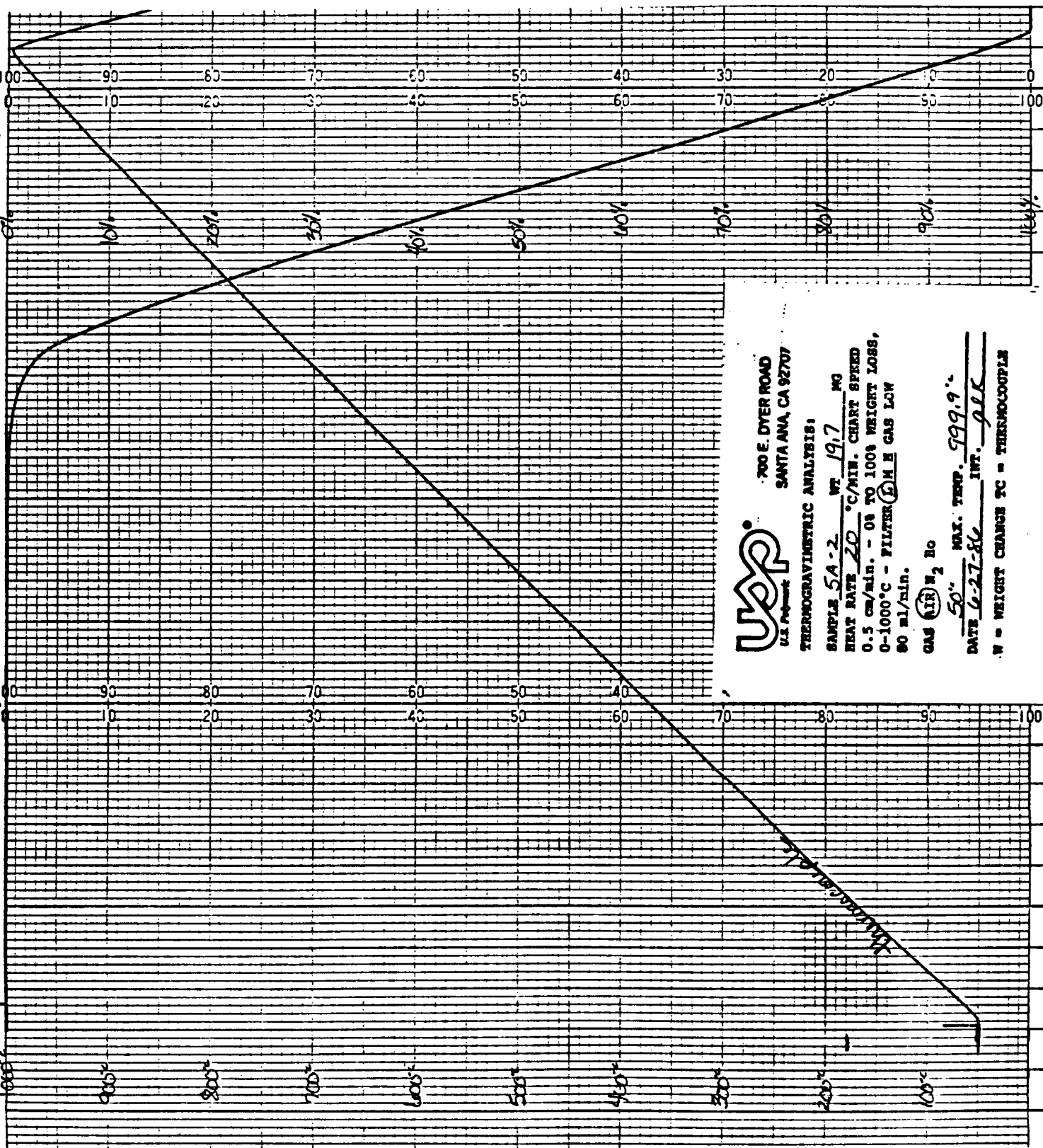
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CHART 6B

CHART NO. PN2-01-25-20M

SOULTEC

(6062)



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SANTA ANA, CA 92707

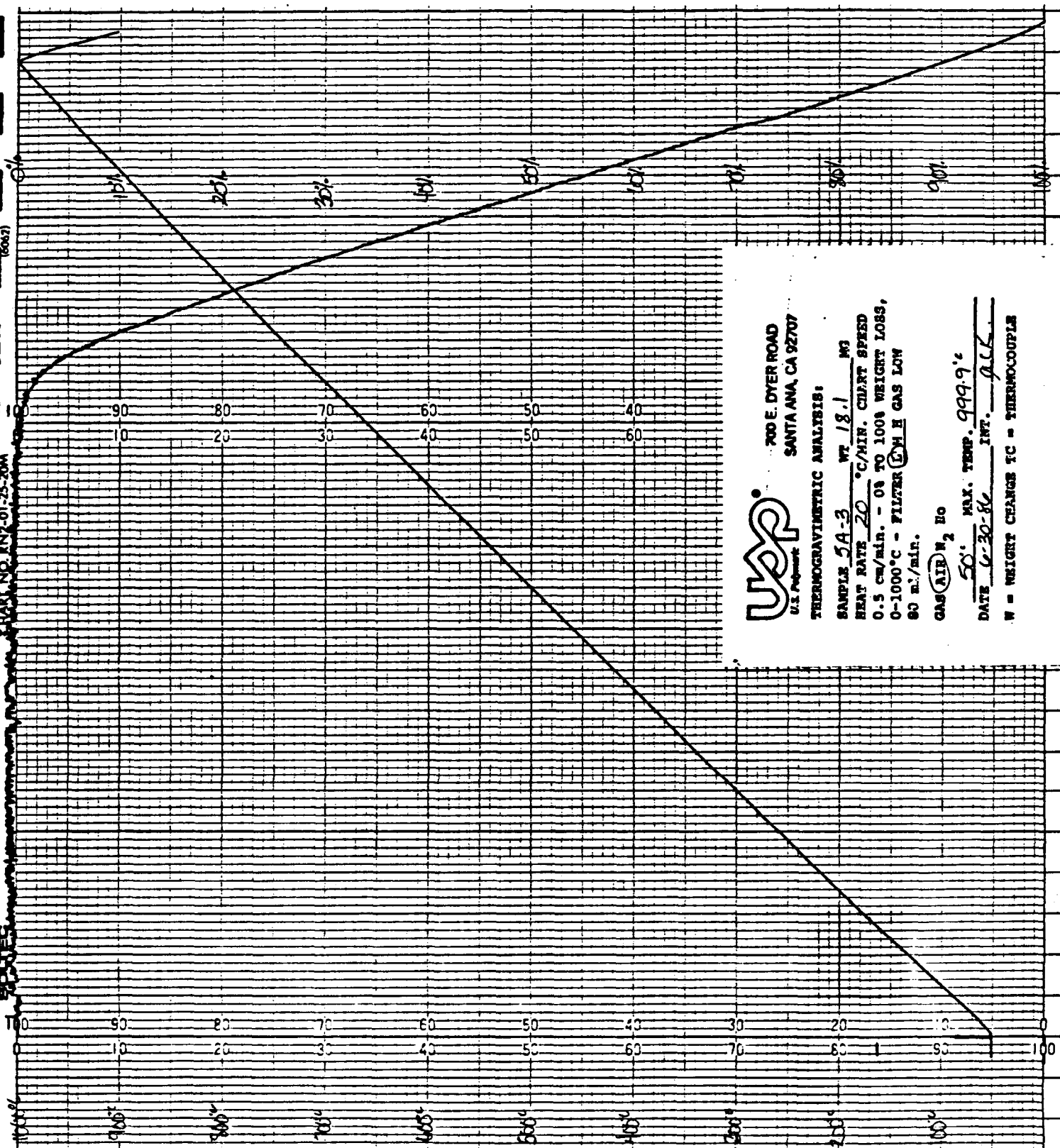
THERMOGRAVIMETRIC ANALYSIS:

SAMPLE 5A-2 WT 19.7 MG
HEAT RATE 20 °C/MIN. CHART SPEED
0.5 cm/min. - ON TO 100% WEIGHT LOSS,
0-1000°C - FILTER 2 IN E GAS LOW
80 ml/min.

GAS AIR N₂ He
50° MAX. TEMP. 999.9°
DATE 6-27-86 INT. gls
W = WEIGHT CHANGE TC = THERMOCOUPLE

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CHART 6C



UAP
U.S. PATENT

700 E. DYER ROAD
SANTA ANA, CA 92707

THERMOGRAVIMETRIC ANALYSIS:

SAMPLE 5A-3 WT 18.1 MG
HEAT RATE 20 °C/MIN. CULANT SPEED
0.5 cm/min. - 08 TO 100% WEIGHT LOSS,
0-1000°C - FILTER 0.1 µm GAS LOW
50 ml/min.

GAS AIR N₂ He

50° MAX. TEMP. 999.9°

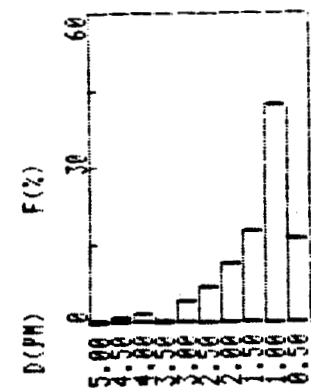
DATE 6-30-86 INT. 9.1

W = WEIGHT CHANGE TC = THERMOCOUPLE

* DISTRIBUTION TABLE (BY VOL.)

D (PM)	F (%)	R (%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	1.4	2.2
3.50-3.00	0.0	2.2
3.00-2.50	3.7	5.9
2.50-2.00	6.6	12.6
2.00-1.50	11.4	23.9
1.50-1.00	17.7	41.6
1.00-0.50	42.3	84.0
0.50-0.00	16.0	100.0
D(AVE)	0.90 (PM)	

* DISTRIBUTION GRAPH (BY VOL.)

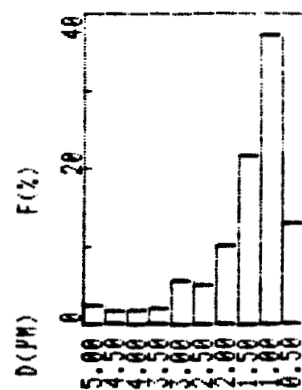


Lot #5A-1
Sample 1

* DISTRIBUTION TABLE (BY VOL.)

D (PM)	F (%)	R (%)
5.00 <	0.0	0.0
5.00-4.50	2.2	2.2
4.50-4.00	1.6	3.8
4.00-3.50	1.8	5.6
3.50-3.00	1.9	7.4
3.00-2.50	5.6	13.0
2.50-2.00	5.0	18.0
2.00-1.50	10.1	28.1
1.50-1.00	21.8	49.9
1.00-0.50	37.3	87.1
0.50-0.00	12.9	100.0
D(AVE)	1.00 (PM)	

* DISTRIBUTION GRAPH (BY VOL.)



Lot #5A-1
Sample 2

HORIBA CAPA-500
PARTICLE ANALYZER

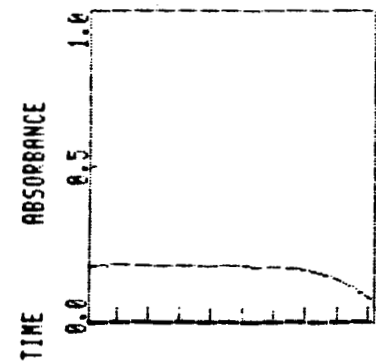
DATE 5-22-86
SAMPLE NASA Lot #5A-1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* CONDITIONS

SOLV. VISC 19.90 (CP)
SOLV. DENS 1.11 (G/CC)
SAMP. DENS 1.90 (G/CC)
D (MAX) 5.0 (PM)
D (MIN) 0.01 (PM)
D (DIV) 0.50 (PM)
SPEED 5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA



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HORIBA CAPA-500
PARTICLE ANALYZER

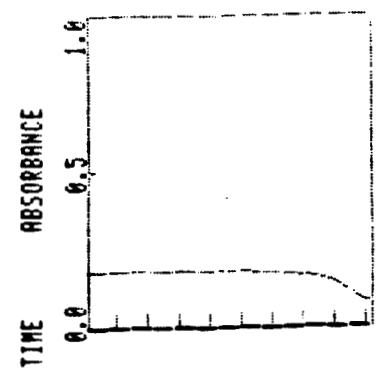
DATE 5-22-86
SAMPLE NASA Lot #5A-1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* CONDITIONS

SOLV. VISC 19.90 (CP)
SOLV. DENS 1.11 (G/CC)
SAMP. DENS 1.90 (G/CC)
D (MAX) 5.0 (PM)
D (MIN) 0.01 (PM)
D (DIV) 0.50 (PM)
SPEED 5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

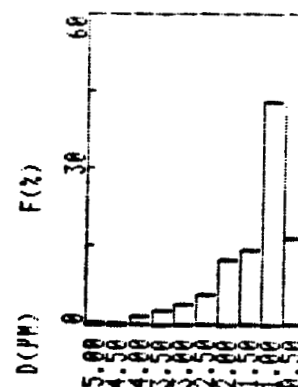
* DATA



* DISTRIBUTION TABLE (BY VOL.)

D (PM)	F (%)	R (%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	1.5	1.5
3.50-3.00	2.5	3.9
3.00-2.50	3.8	7.8
2.50-2.00	5.6	13.4
2.00-1.50	12.4	25.8
1.50-1.00	14.2	40.0
1.00-0.50	43.2	83.2
0.50-0.00	16.8	100.0
D(AVE)	0.88 (PM)	

* DISTRIBUTION GRAPH (BY VOL.)



Lot# 5A-2
Sample #2

HORIBA CAPA-500

PARTICLE ANALYZER

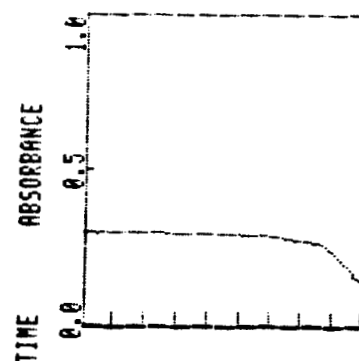
DATE 5-27-86
SAMPLE NASA LOT# 5A-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* CONDITIONS

SOLV. VISC 19.90 (CP)
SOLV. DENS 1.11 (G/CC)
SAMP. DENS 1.90 (G/CC)
D (MAX) 5.0 (PM)
D (MIN) 0.01 (PM)
D (DIV) 0.50 (PM)
SPEED 5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

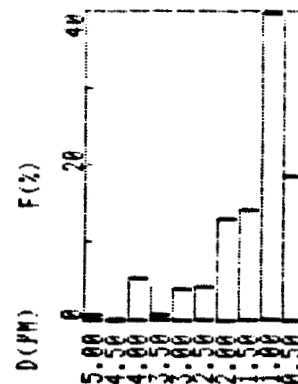


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* DISTRIBUTION TABLE (BY VOL.)

D (PM)	F (%)	R (%)
5.00 <	0.0	0.0
5.00-4.50	0.6	0.6
4.50-4.00	0.0	0.6
4.00-3.50	5.3	5.9
3.50-3.00	0.5	6.5
3.00-2.50	4.0	10.4
2.50-2.00	4.1	14.5
2.00-1.50	13.1	27.7
1.50-1.00	14.1	41.7
1.00-0.50	39.7	81.4
0.50-0.00	18.6	100.0
D(AVE)	0.90 (PM)	

* DISTRIBUTION GRAPH (BY VOL.)



Lot# 5A-2
Sample #1

HORIBA CAPA-500

PARTICLE ANALYZER

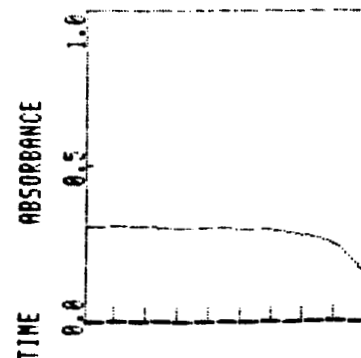
DATE 5-27-86
SAMPLE NASA LOT# 5A-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* CONDITIONS

SOLV. VISC 19.90 (CP)
SOLV. DENS 1.11 (G/CC)
SAMP. DENS 1.90 (G/CC)
D (MAX) 5.0 (PM)
D (MIN) 0.01 (PM)
D (DIV) 0.50 (PM)
SPEED 5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA



HORIBA CAPA-500

PARTICLE ANALYZER

DATE 5-27-86

SAMPLE NASA LOT#5A-3

SOLVENT ETHYL-GLYCOL
C=0.01mg/ml

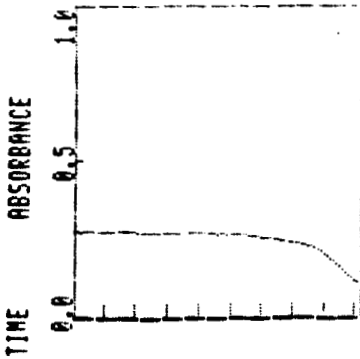
* CONDITIONS

SOLV.VISC 19.98(CP)
SOLV.DENS 1.11(G/CC)
SAMP.DENS 1.90(G/CC)
D(MAX) 5.0 (PM)
D(MIN) 0.01(PM)
D(DIV) 0.50(PM)

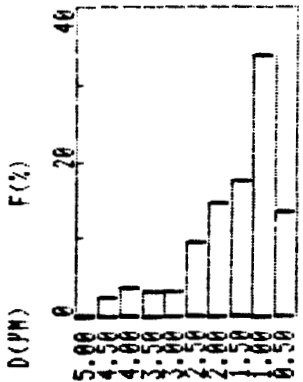
SPEED 5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA



LOT# 5A-3
Sample #1



* DISTRIBUTION GRAPH (BY VOL.)

* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	2.3	2.3
4.00-3.50	3.4	5.7
3.50-3.00	3.1	8.8
3.00-2.50	3.1	11.9
2.50-2.00	9.2	21.2
2.00-1.50	14.5	35.7
1.50-1.00	17.2	52.9
1.00-0.50	33.9	86.8
0.50-0.00	13.2	100.0
D(AVE)	1.08 (PM)	

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HORIBA CAPA-500

PARTICLE ANALYZER

DATE 5-27-86

SAMPLE NASA LOT#5A-3

SOLVENT ETHYL-GLYCOL
C=0.01mg/ml

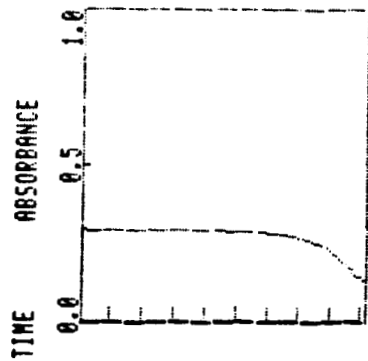
* CONDITIONS

SOLV.VISC 19.98(CP)
SOLV.DENS 1.11(G/CC)
SAMP.DENS 1.90(G/CC)
D(MAX) 5.0 (PM)
D(MIN) 0.01(PM)
D(DIV) 0.50(PM)

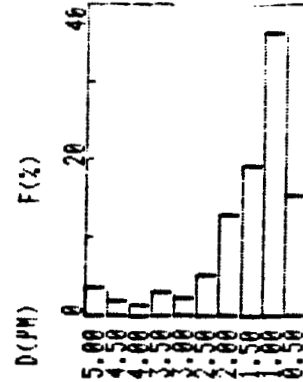
SPEED 5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA



LOT# 5A-3
Sample #2



* DISTRIBUTION GRAPH (BY VOL.)

* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	3.5	3.5
4.50-4.00	1.7	5.3
4.00-3.50	1.2	6.5
3.50-3.00	3.0	9.5
3.00-2.50	2.1	11.6
2.50-2.00	5.1	16.6
2.00-1.50	12.6	29.3
1.50-1.00	19.1	48.4
1.00-0.50	36.3	84.7
0.50-0.00	15.3	100.0
D(AVE)	0.98 (PM)	

TABLE OF CONTENTS

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

91LD Resin Lot for NASA Lot# 5

<u>TEST</u>	<u>PAGE</u>
1. Resin Solids.....	1
2. Specific Gravity.....	1
3. Brookfield Viscosity.....	1
4. Gel Time.....	1
5. Atomic Absorption.....	1
6. Gas Chromatography.....	1
7. TGA.....	1
8. DSC.....	1
9. HPLC.....	1
10. GPC.....	1
11. pH.....	1
12. Phenol Content.....	2
13. Chang's Index.....	2
14. RDS.....	2
15. NMR.....	2

CHARTS

Gas Chromatography.....	6A - 6B
TGA.....	7B
DSC.....	8A - 8B
HPLC.....	9A - 9B
GPC.....	10A - 10B
RDS.....	14A - 14B
NMR.....	15A - 15B



RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

91LD Resin Lot for NASA Lot# 5

(Note sample 5A was used for production. Sample 5-1 was tested, but not used for production).

1. Resin Solids, % PTM-7C	<u>#5-A</u> 70.7 70.6 <u>70.7</u> AVG. 70.7	<u>#5-1</u> 72.0 71.6 <u>71.6</u> 71.7
2. Specific Gravity @ 25°C PTM-29C	1.138	1.139
3. Viscosity, Brookfield, cps. @ 22.8°C PTM-14C	1500	1500
4. Gel Time, min:sec PTM-47B	3:06	3:50
5. Atomic Absorption, ppm CTM-53B (Values are averages of two determinations)	Na 3.5 K 0.5 Ca 2.5 Mg 0.0 Li 0.0 TOTAL 6.5	4 0 0 10 0 14
6. Volatiles, Gas Chromatography CTM-55	See Charts 6A-6B	
7. TGA, % Weight Loss at 500°C CTM-51 (AIR)	--	8.4
	See Chart 7B	
8. DSC, temperature °C CTM-50A	171.5	188
	See Chart 8A-8B	
9. HPLC CTM-49A	See Chart 9A-9B	
10. GPC, Average molecular wt. CTM-49A	235?	1902
	See Chart 10A-10B	
11. pH, units CTM-1B	8.3	8.3

91LD Resin Lot for NASA Lot# 5

12. Phenol Content, % CTM-55 Appendix 1	<u>#5-A</u>	<u>#5-1</u>
	11.94	11.83
	<u>11.74</u>	<u>11.86</u>
	AVG. 11.84	11.84
13. Chang's Index, ml. CTM-5B	24.8	24.8
14. RDS, Minimum Viscosity, cps. CTM-57A	<u>Min. Visc.</u>	<u>°C</u>
	#5-A	43
	#5-1	60
		102
15. NMR Vendor procedure		
	See Charts 14A-14B	
	See Charts 15A-15B	

U. S. Polymeric


Hamid M. Quraishi, Manager
Quality Assurance Department

TYPICAL GAS CHROMATOGRAPH SET-UP

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Operator <u>J. A. J.</u>	Date <u>12/11/86</u>
Column <u>6 ft.</u>	Detector <u>FID</u>
Length <u>1/4 in.</u>	Voltage <u> </u>
Dia. <u>1/4 in.</u>	Sensit. <u> </u>
Liquid Phase <u>RT-1000</u>	Flow Rates, ml/min
Wt. % <u>0.1</u>	Hydrogen <u>60</u> Air <u>90</u>
Support <u>GRAPHAC</u>	Scavenge <u> </u>
Mesh <u>80/100</u>	Split <u> </u>
Carrier Gas <u>He</u>	Temperature, °C
Rotameter <u> </u>	Det. <u>220</u> Inj. <u>200</u>
Inlet Press <u>60</u> psig	Column Initial <u>60</u>
Rate <u>30</u> ml/min	Final <u>210</u>
CHART SPEED <u> </u>	Rate <u>500</u> MIN
SAMPLE <u>91CD-5-1</u>	Solvent <u>THF</u>
Size <u>0.1 µl</u>	Concn. <u>0.10021 g/ml</u>

GAS CHROMATOGRAPHY STANDARD SOLVENT

TEST METHOD CTM-55

STANDARD SOLVENT/MONOMER

RETENTION TIME (MINS.)

MEOH	.6
ETHANOL	1.18
MECL2	1.28
ACETONE	1.45
IPA	1.83
THF	3.08
ACETONITRILE	3.2
CRESOL	4.03
MEK	4.08
FURFURAL	15.03
TOLUENE	17.98
CHLOROBENZENE	19.6
PHENOL	22.08

NOTE: THF WAS USED TO DILUTE THE RESIN SAMPLES.

*** REAL TIME CHROMATOGRAM ***

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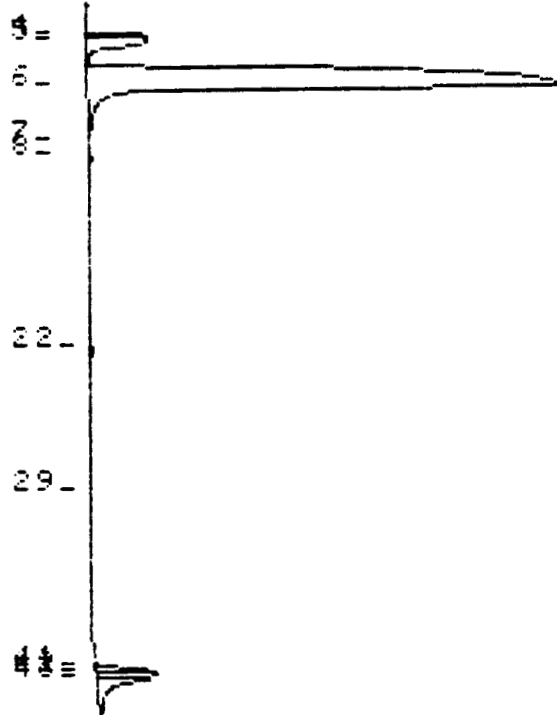
FINAL FULL SCALE MV.=1000.00

SAMPLE: 91 LD 5A
MISC.: C=0.10136 GMS/MLTIME: 9:45
DATE: 12/11/86
OPERATOR: JGZRUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
2	63	4009	.093	1	439
4	1.63	81207	1.881	2	11904
5	1.83	227690	5.275	2	11890
6	3.30	3598800	83.371	3	95752
7	5.03	5309	.123	4	214
8	5.55	4839	.112	3	457
22	11.65	19256	.446	2	964
29	16.23	1718	.040	2	70
41	21.85	69893	1.619	2	10336
42	21.98	124790	2.891	2	12126
43	22.15	179090	4.149	2	10216

TOTAL AREA= 4316600
THRESHOLD= 1
MIN PK WIDTH= 15
AREA REJECT= 1000

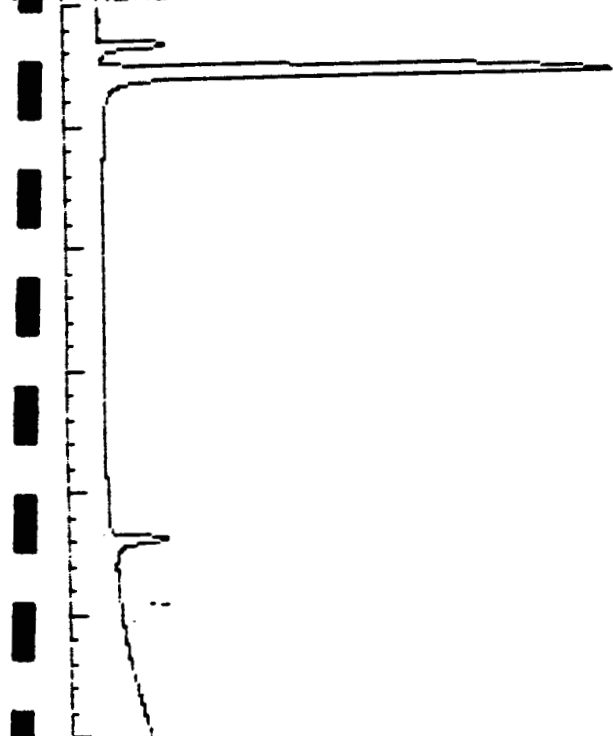
VERTICAL SCALE FACTOR: 1X

SAMPLE: 91 LD 5A
MISC.: C=0.10136 GMS/MLTIME: 9:45
DATE: 12/11/86
OPERATOR: JGZRUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
4	1.63	81207	1.888	2	11904
5	1.83	227690	5.294	2	11890
6	3.30	3598800	83.679	3	95752
22	11.65	19256	.448	2	964
41	21.85	69893	1.625	2	10336
42	21.98	124790	2.902	2	12126
43	22.15	179090	4.164	2	10216

TOTAL AREA= 4300726
THRESHOLD= 1
MIN PK WIDTH= 15
AREA REJECT= 10000

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000.00

SAMPLE: 91 LD 5-1
MISC.: C=0.10021 GMS/ML

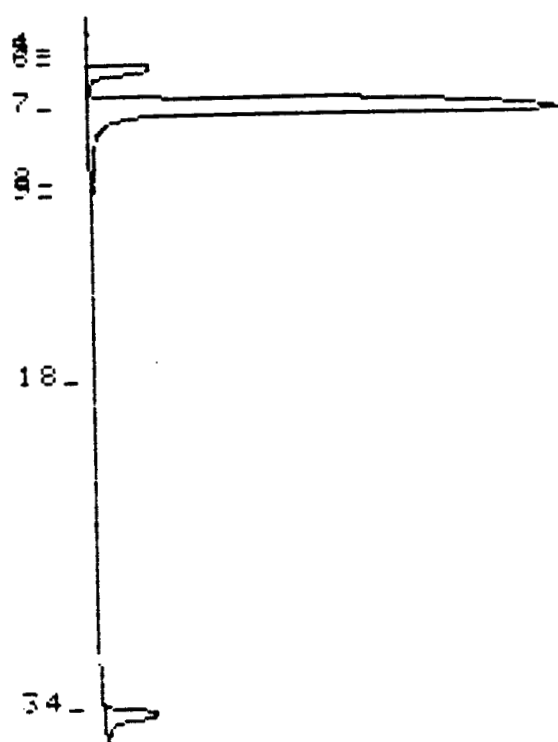
TIME: 8:49
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA B % L	PEAK HT
3	.63	3675	.103 2	327
4	1.25	2069	.058 2	96
5	1.43	1867	.052 2	186
6	1.65	267030	7.480 2	12299
7	3.15	2992500	83.822 3	97560
8	5.50	9460	.265 4	589
9	5.83	31392	.879 4	343
18	11.68	6164	.173 1	337
34	21.95	255890	7.168 1	10548

TOTAL AREA= 3570046
THRESHOLD= 1
MIN PK WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR: 1X



SAMPLE: 91 LD 5-1
MISC.: C=0.10021 GMS/ML

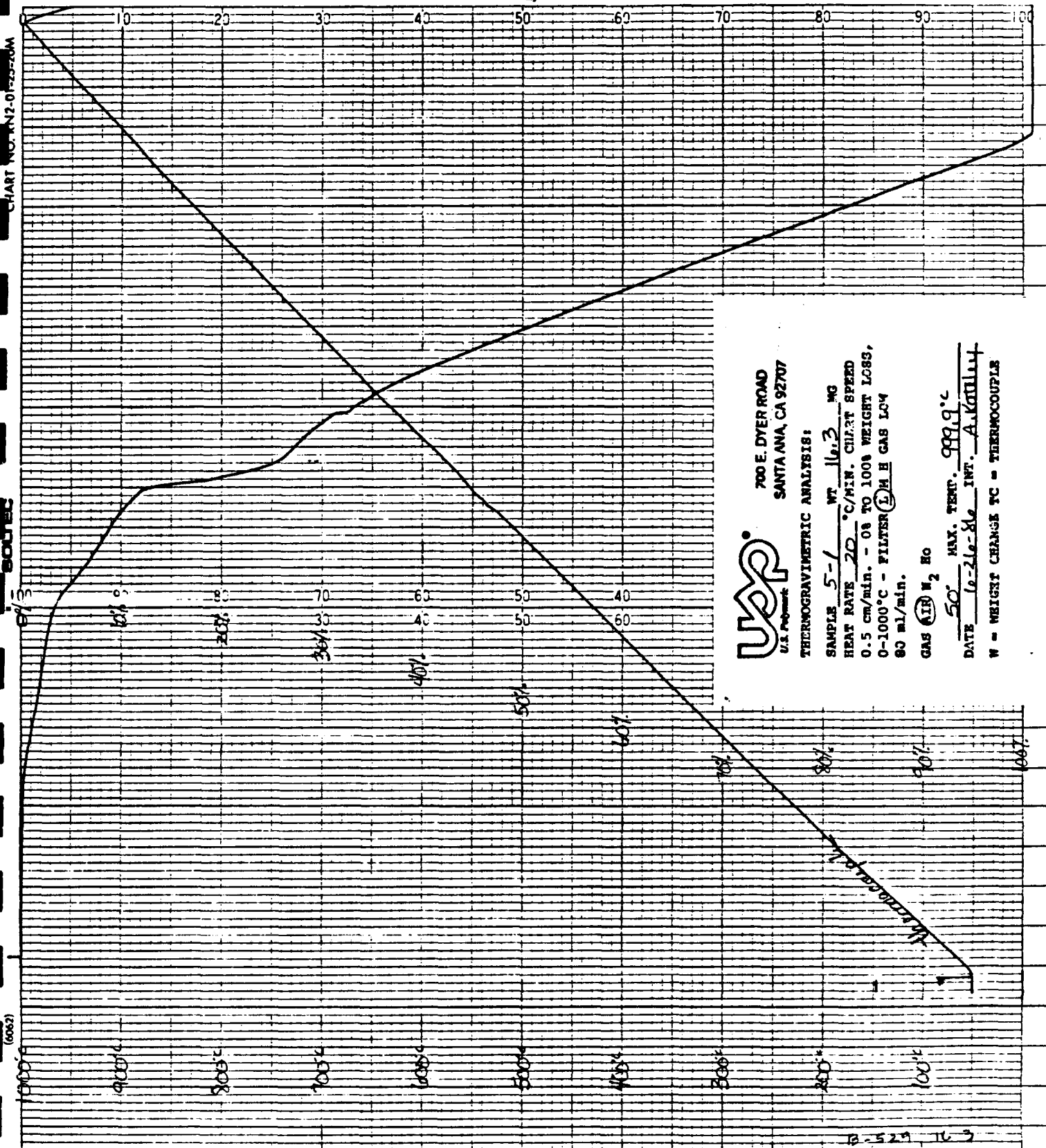
TIME: 8:49
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA B % L	PEAK HT.
6	1.65	267030	7.529 2	12299
7	3.15	2992500	84.372 3	97560
9	5.83	31392	.885 4	343
34	21.95	255890	7.215 1	10548

TOTAL AREA= 3546812
THRESHOLD= 1
MIN PK WIDTH= 15
AREA REJECT= 10000

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700 E. DYER ROAD
SANTA ANA, CA 92707

U.S. Pyrolysis
THERMOGRAVIMETRIC ANALYSIS:

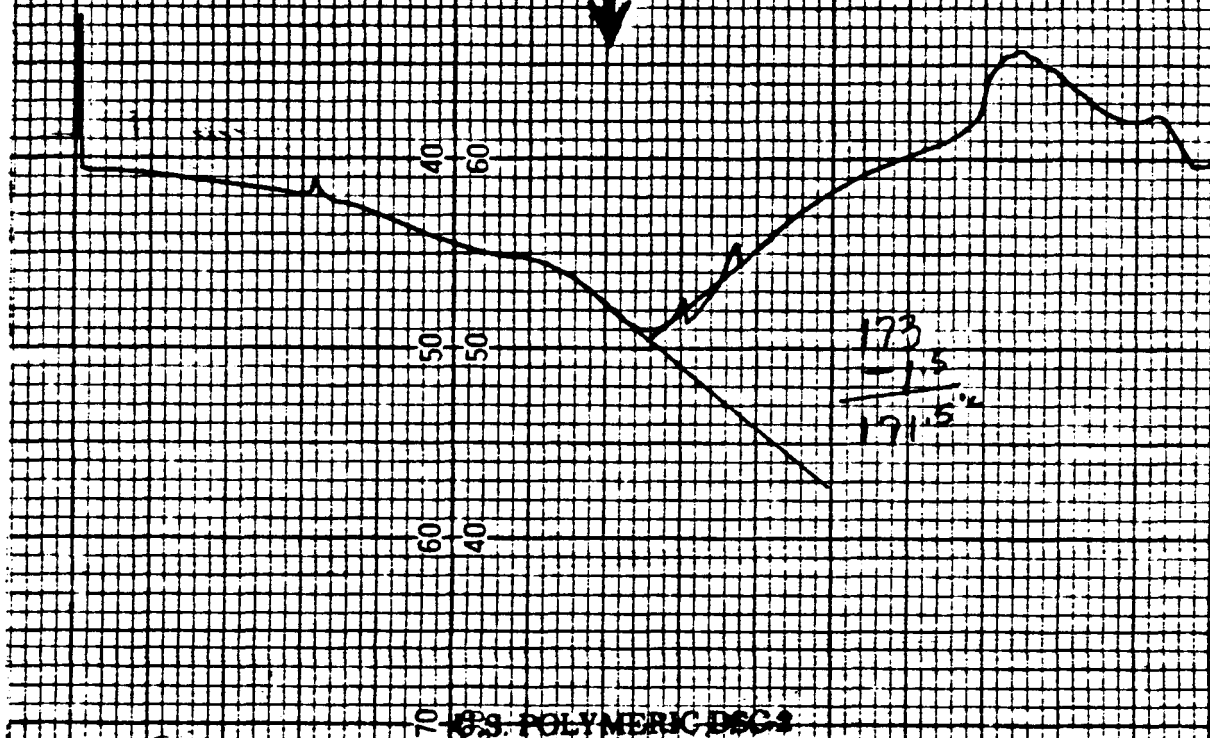
SAMPLE 5-1 WT. 16.3 MG
HEAT RATE 20 °C/MIN. CHART SPEED
0.5 cm/min. - 08 TO 100% WEIGHT LOSS,
0-1000°C - FILTER 10 H GAS LOG
80 ml/min.

GAS AIR N₂ He
MAX. TEMP. 999.9°C
DATE 10-26-86 INT. A. K. M. L. L. L.
W = WEIGHT CHANGE TC = THERMOCOUPLE

B-529 163

8-25-86 LAST CALIBRATION DATE
 1.5 CALIBRATION DELTA °C

EXOTHERM



70-83 POLYMERIC DSC

Sample 915D 5A Wt: 4.7 mg
 Heat Rate: 10 °C/min Range: 2.0 mW/sec
 Recorder Span: 50 mV Chart speed: 30 mm/min
 Temp Limits: Lower 25 °C Upper 325 °C
 Mode: Hold/Auto Cool Cycle Cooling Rate: 40 °C/min
 Operator: A. KATLEY Date: 8-29-86

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DUPONT Instruments



MEASURED VARIABLE _____

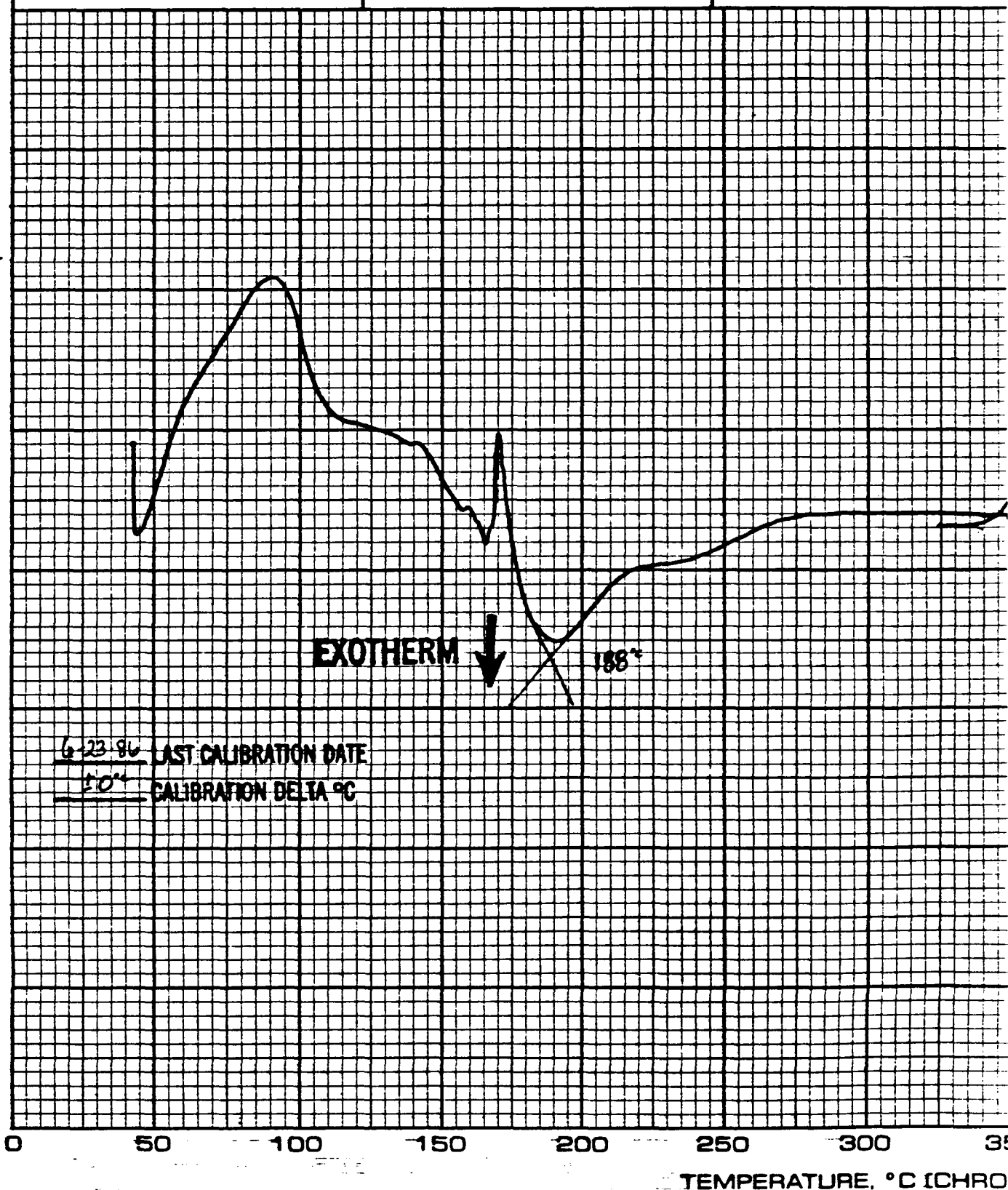
RUN NO. _____ DATE 6-23-86
 OPERATOR gux
 SAMPLE: 91-LD 5-1
 ATM N₂ @ 1atm
 FLOW RATE 40 ml/min

T-AXIS

SCALE, °C/in. 50
 PROG. RATE, °C/min 20°
 HEAT ☒ COOL ☐ ISO ☐
 SHIFT, in. 0

DTA-DSC

SCALE, °C/in. 5.0 15x
 (mcal/sec)/in. _____
 WEIGHT, mg 5.8
 REFERENCE _____
alum seal



AT FILE A:PHEND31.HDR TAKEN 09-05-1986 14:03:53

***** AREA PERCENT REPORT *****

* Sample Name: 91LD,5A,C=7.13 Operator Initials: JGZ *
* Date: 09-05-1986 14:03:53 Method:PHENDLIC DATA FILE: A:PHEND31.PTS *
* Interface: 4 Cycle#: 31 Channel#: 0 Vial#: N.A. *
* Starting Peak Width: 10 Threshold: .01 *

* Instrument Type: BECKMAN HPLC Column Type: MICROBONDAPAK C-18 *
* Solvent Description: THF/WATER, 2:1 BY WEIGHT *
* Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN *
* Detector 0: 220NM/.5AU Detector 1: *
* Misc. Information: LENGTH=25 *

Starting Delay: 0.00 Ending Retention Time: 10.00

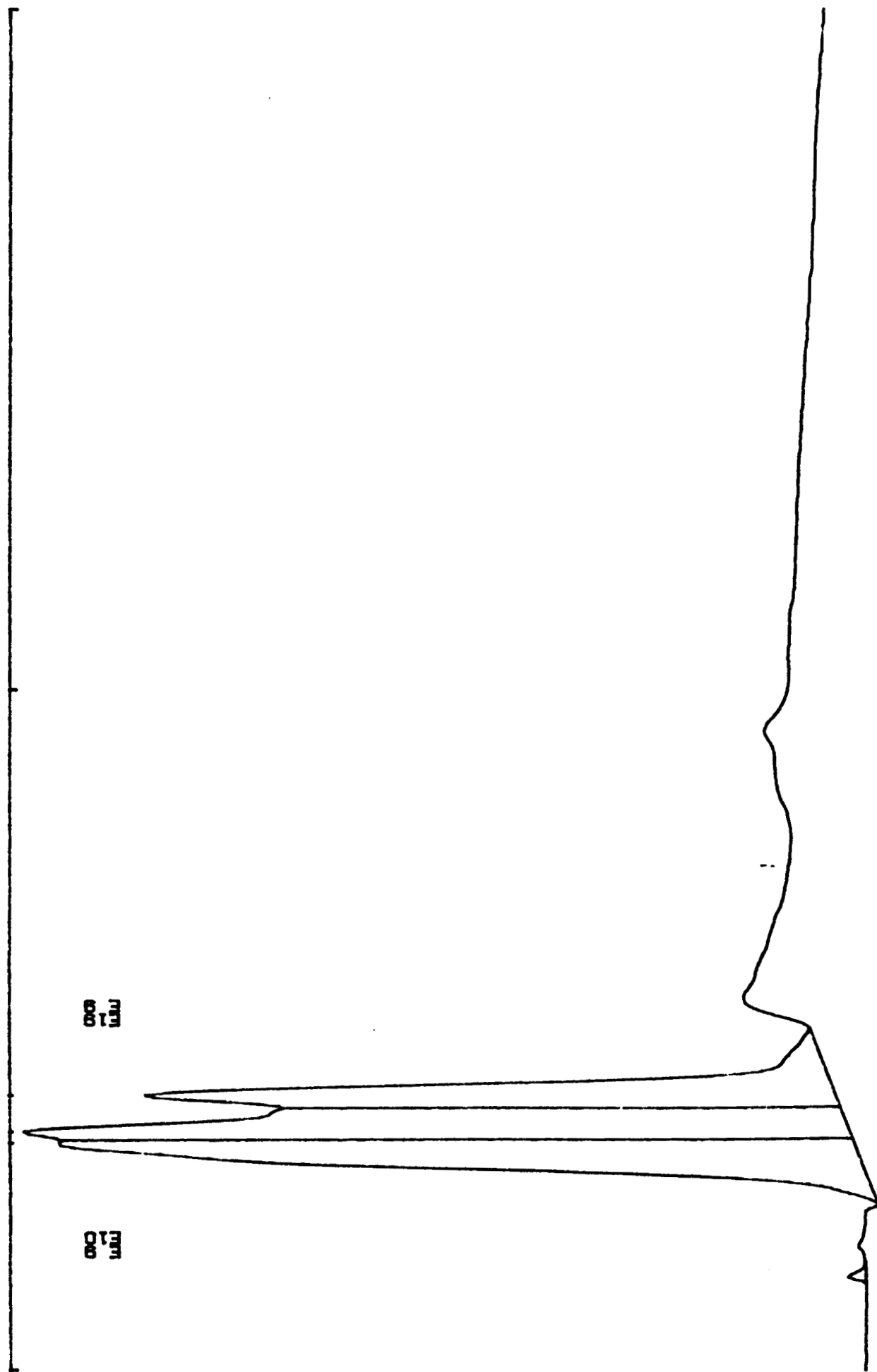
Pk No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
	1.70	66122	36.4482	2	5215	100.000	12.7
3	1.78	65456	36.0814	2	5416	98.993	12.1
4	2.05	49835	27.4704	2	4528	75.368	11.0

Total Area: 181413 Area Reject: 1000 One sample per 1.000 sec.

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DATA FILE=PHEN031 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.421 MV. HIGH SCALE= 11.033 MV.
91 LD, 5-A, C=7.13 MG/ML, 9/5/86, JGZ

1:38 2.06



DATA FILE A:PHEND32.HDR TAKEN 09-05-1986 14:25:51

***** AREA PERCENT REPORT *****

* Sample Name: 91LD,5-1,C=6.64 Operator Initials: JGZ *
* Date: 09-05-1986 14:25:51 Method:PHENDLIC DATA FILE: A:PHEND32.PTS *
* Interface: 4 Cycle#: 32 Channel#: 0 Vial#: N.A. *
* Starting Peak Width: 10 Threshold: .01 *

* Instrument Type: BECKMAN HPLC Column Type: MICROBONDAPAK C-18 *
* Solvent Description: THF/WATER, 2:1 BY WEIGHT *
* Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN *
* Detector 0: 220NM/.5AU Detector 1: *
* Misc. Information: LENGTH=25 *

Starting Delay: 0.00 Ending Retention Time: 10.00

Peak No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/Height
2	1.78	122964	72.5706	2	5196	100.000	23.7
3	2.07	46477	27.4294	2	4293	37.797	10.8

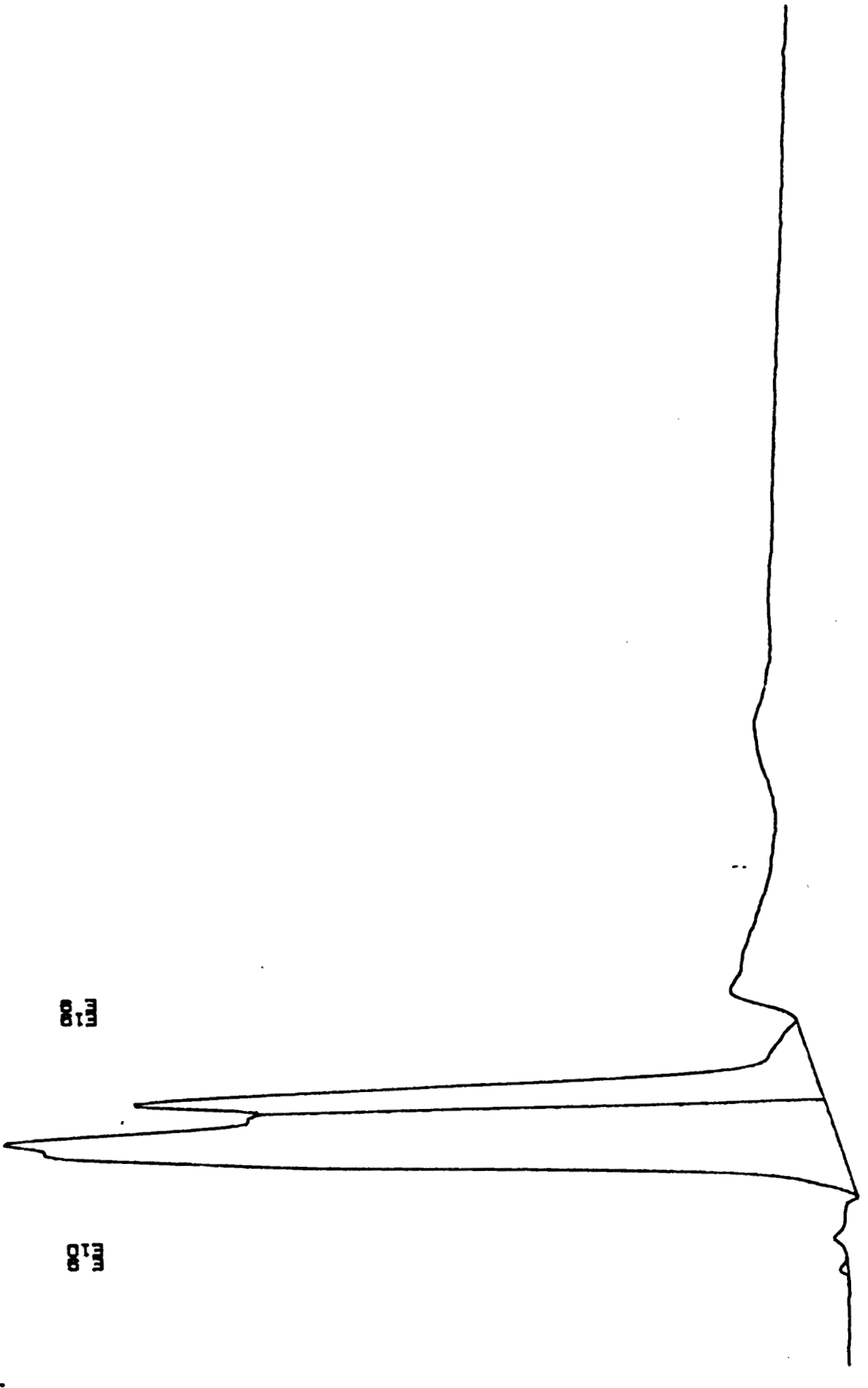
Total Area: 169441 Area Reject: 1000 One sample per 1.000 sec.

DATA FILE-PHEN032 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.404 MV. HIGH SCALE= 10.750 MV.
91 LD, 5-1, C-8.64 MG/ML, 9/5/86, JGZ

1.78
2.97

000
1.00

000
1.00



GPC CALIBRATION PLOT

*** Calibration Data ***

Calibration Name:

Misc Information:

Fit Type: 3

Log Mol Wt = $A + Bx + Cx^2 + Dx^3$

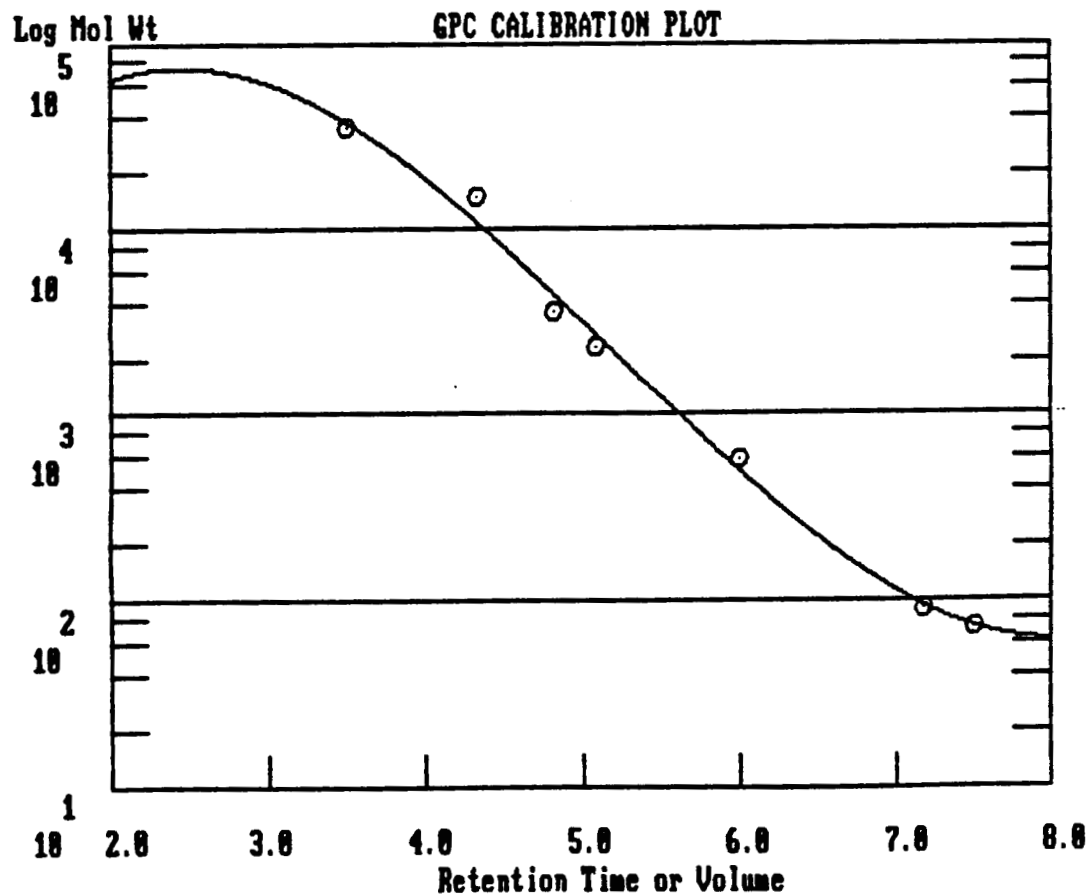
A= 2.538977 B= 2.115815 C= -.5646824

D= 3.606432E-02

Coefficient of Determination: 0.9902

Ret Time Molecular Weight Log Mol Wt

3.50	35000	4.544
4.33	15000	4.176
4.83	3600	3.556
5.09	2350	3.371
6.00	570	2.756
7.17	92	1.964
7.50	72	1.857



***** GPC REPORT *****

```

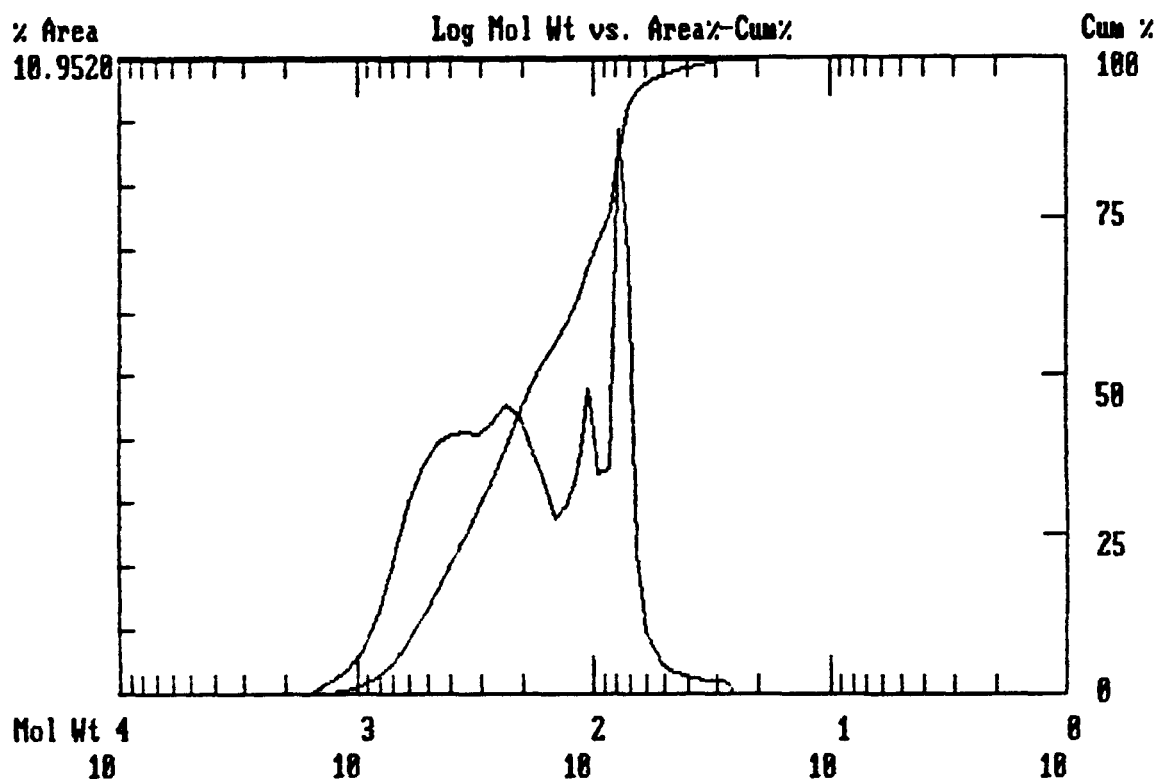
*****
* Sample Name: 9/LD 5A                      Operator Initials: FCB      *
* Date: 10-03-1986 09:47:41 Method:          DATA FILE: A:GPC20.PTS    *
* Interface: 2                               Cycle#: 20                *
* Starting Peak Width: 60 Threshold: 0       Channel#: 0 Vial#: N.A.    *
*****
* Instrument Type: HPLC BECKMAN 334          Column Type: ULTRASTYRAGEL 500A *
* Solvent Description: THF                   *
* Operating Conditions: R.T., FLOW RATE=2.0 ML/MIN *
* Detector 0: 254NM/.1AU                     Detector 1: *
* Misc. Information: CALIBRATION/GPC         *
*****

```

```

Starting Delay: 0.00                      Ending Retention Time: 10.00
Calibration file: GPCMIX
Molecular Weight Distribution Averages
Baseline TIMES: 0.05 to 10.00 MW: %565381040000 to 353268
Process TIMES: 0.05 to 10.00 MW: %565381040000 to 353268
Total Area: 186951
Mw= 235
M= 128
Mn/Mn= 1.8398
Mz= 408

```



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DATA FILE A:GPC39.HDR TAKEN 08-06-1986 13:18:25

***** GPC REPORT *****

```

*****
* Sample Name: 91LD 5-1 CIC                      Operator Initials: GBF      *
* Date: 08-06-1986 13:09:02 Method:              DATA FILE: A:GPC39.PTS    *
* Interface: 5                               Cycle#: 39          Channel#: 0    Vial#: N.A.  *
* Starting Peak Width: 60 Threshold: 0           *
*****
* Instrument Type: HPLC/BECKMAN                  Column Type: ULTRASTYRAGEL 500A  *
* Solvent Description: THF                      *
* Operating Conditions: T=35C FLOWRATE=2.0ML/MIN *
* Detector 0: 254NM/.1AU                      Detector 1:      *
* Misc. Information: CALIBRATION/GPC           *
*****

```

Starting Delay: 0.00 Ending Retention Time: 10.00

Calibration file: GPCPHEN

Molecular Weight Distribution Averages

Baseline TIMES: 3.85 to 10.00 MW: 22295 to 2

Process TIMES: 3.85 to 10.00 MW: 22295 to 2

Total Area: 200232

MW= 1902

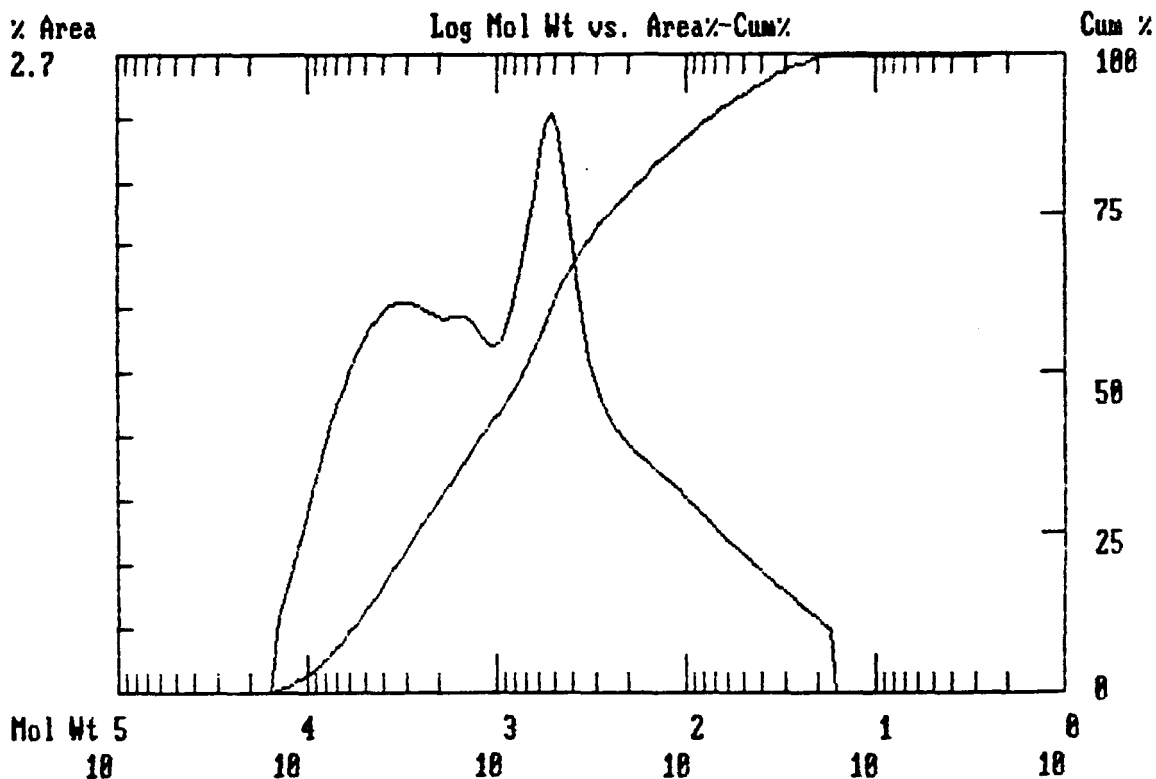
Mn= 207

Mw/Mn= 9.1879

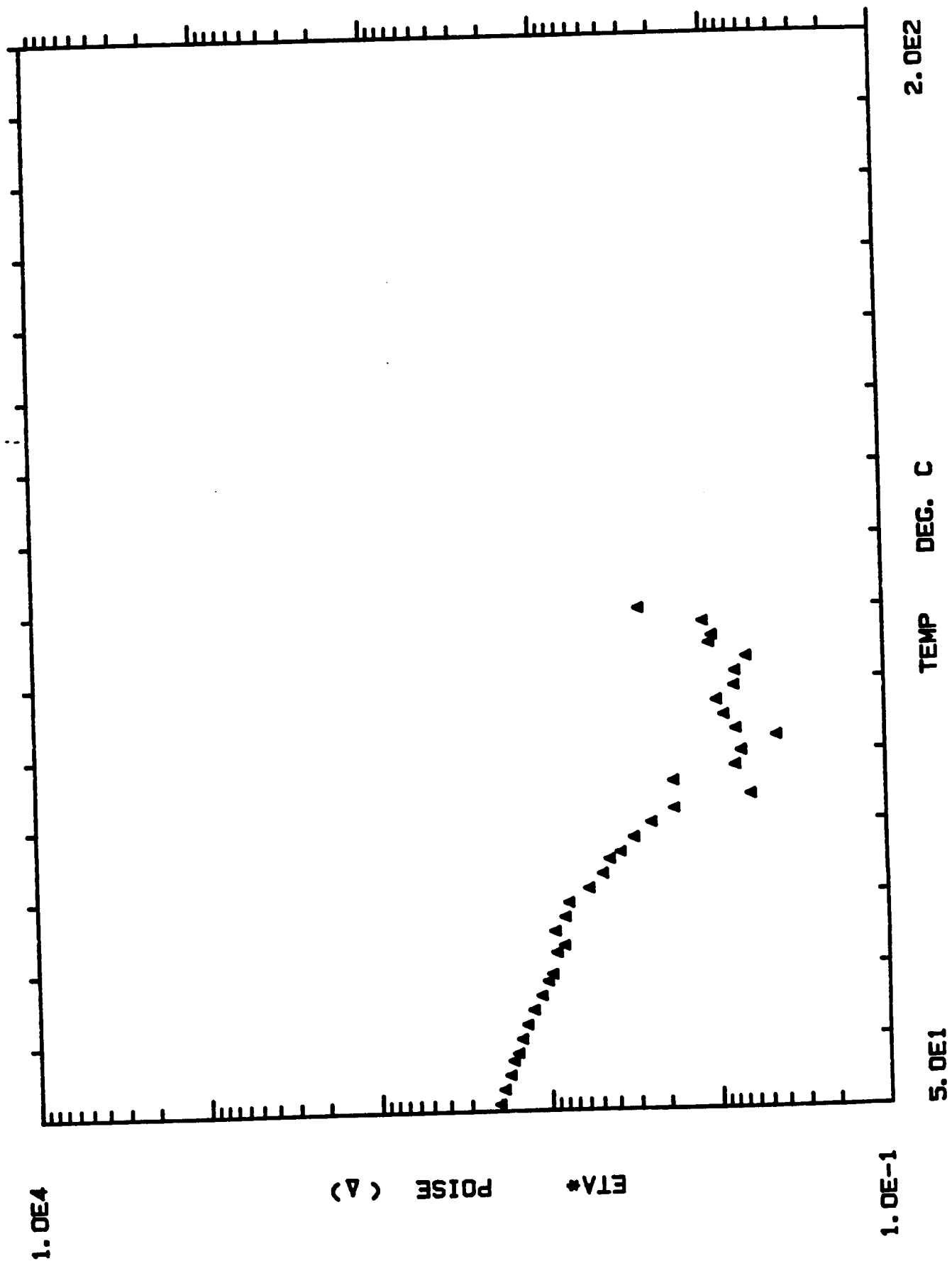
Mz= 5518

Mv= 1597

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NASA FINGERPRINT VISCOSITY PROFILE RESIN 91LD NASA LOT 5A USP#36255-19



PAGE TITLE

Rheometrics RECAP II

Experiment No. : 20 Sample No. : 1

Title:
NASA FINGERPRINT VISCOSITY PROFILE RESIN 91LD NASA LOT 5A USP#36255-19

Operator :cp

Date and Time : Monday, August 25, 1986 - 12:55:38

Operating Mode : DYNAMIC

Sweep Type : CURE

Geometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

Notes :
STRAIN =50%
FREQUENCY =10 RAD/SEC

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NASA FINGERPRINT VISCOSITY PROFILE RESIN 91LD NASA LOT 5A USP#36255-19

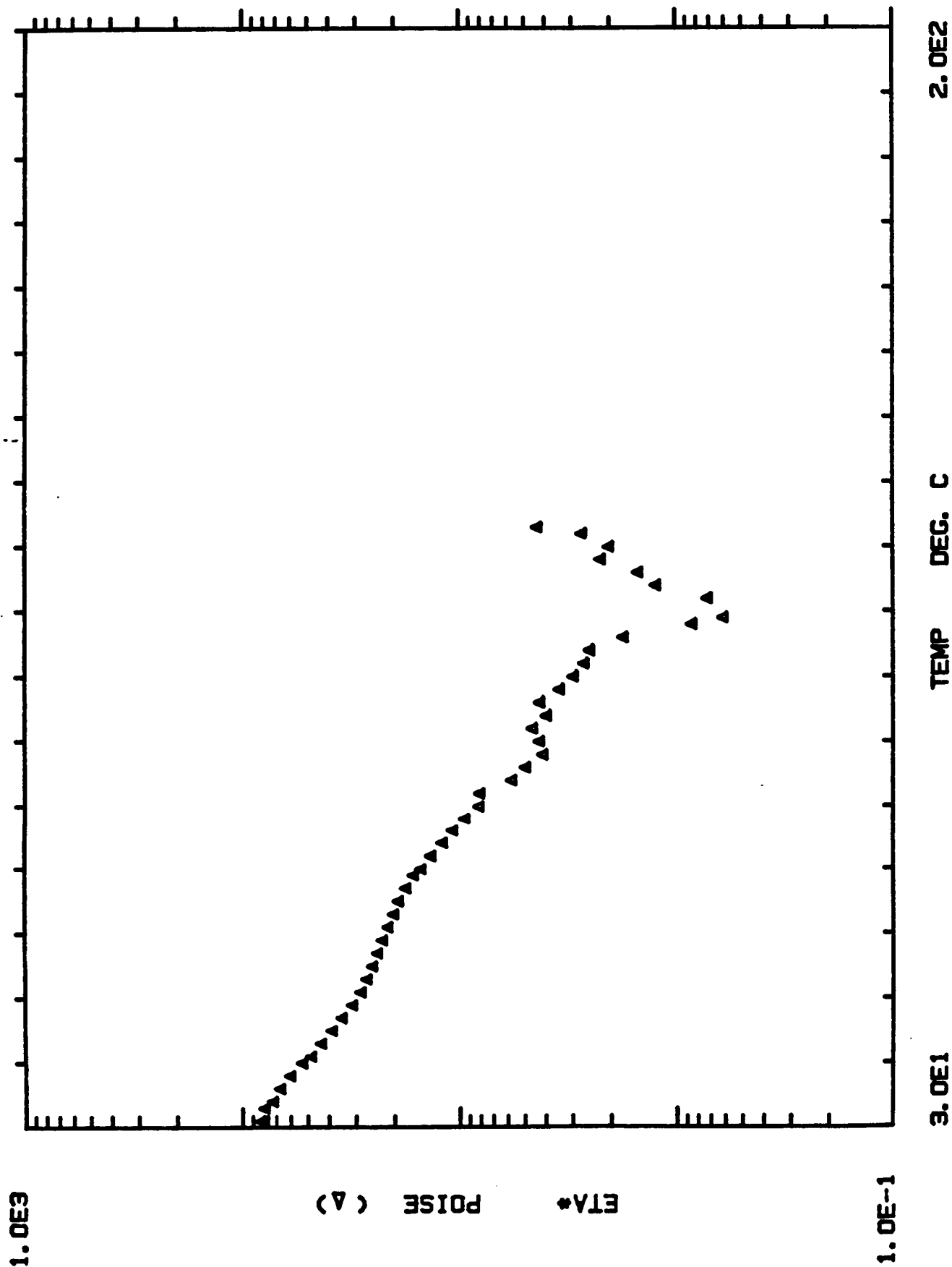
NO.	ETA* POISE	ETA' POISE	ETA'' POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	5.539e+001	4.719e+001	2.900e+001	6.953e+000	2.000e-001	3.000e+001
2	5.105e+001	4.393e+001	2.599e+001	6.411e+000	1.000e+000	3.000e+001
3	4.741e+001	4.138e+001	2.314e+001	5.952e+000	2.000e+000	3.200e+001
4	4.381e+001	3.841e+001	2.107e+001	5.502e+000	3.000e+000	3.300e+001
5	4.042e+001	3.539e+001	1.953e+001	5.077e+000	4.000e+000	3.500e+001
6	3.638e+001	3.218e+001	1.696e+001	4.570e+000	5.000e+000	3.600e+001
7	3.255e+001	2.885e+001	1.509e+001	4.088e+000	6.000e+000	3.800e+001
8	3.049e+001	2.721e+001	1.376e+001	3.831e+000	7.000e+000	4.000e+001
9	2.726e+001	2.381e+001	1.328e+001	3.421e+000	8.000e+000	4.200e+001
10	2.575e+001	2.250e+001	1.252e+001	3.234e+000	9.000e+000	4.300e+001
11	2.374e+001	2.063e+001	1.174e+001	2.983e+000	1.000e+001	4.500e+001
12	2.217e+001	1.952e+001	1.051e+001	2.785e+000	1.100e+001	4.700e+001
13	2.105e+001	1.881e+001	9.455e+000	2.645e+000	1.200e+001	4.900e+001
14	2.002e+001	1.794e+001	8.883e+000	2.514e+000	1.300e+001	5.100e+001
15	1.876e+001	1.711e+001	7.686e+000	2.357e+000	1.400e+001	5.300e+001
16	1.725e+001	1.612e+001	6.139e+000	2.166e+000	1.500e+001	5.500e+001
17	1.643e+001	1.540e+001	5.736e+000	2.064e+000	1.600e+001	5.700e+001
18	1.538e+001	1.456e+001	4.958e+000	1.932e+000	1.700e+001	5.800e+001
19	1.458e+001	1.383e+001	4.618e+000	1.831e+000	1.800e+001	6.000e+001
20	1.352e+001	1.286e+001	4.152e+000	1.699e+000	1.900e+001	6.200e+001
21	1.234e+001	1.186e+001	3.408e+000	1.550e+000	2.000e+001	6.400e+001
22	1.102e+001	1.048e+001	3.389e+000	1.384e+000	2.100e+001	6.600e+001
23	1.007e+001	9.051e+000	4.404e+000	1.264e+000	2.200e+001	6.800e+001
24	9.437e+000	9.125e+000	2.407e+000	1.185e+000	2.300e+001	6.900e+001
25	8.844e+000	8.528e+000	2.341e+000	1.112e+000	2.400e+001	7.200e+001
26	7.983e+000	7.804e+000	1.681e+000	1.003e+000	2.500e+001	7.300e+001
27	9.065e+000	8.948e+000	1.451e+000	1.139e+000	2.600e+001	7.500e+001
28	7.869e+000	7.745e+000	1.390e+000	9.886e-001	2.700e+001	7.700e+001
29	7.434e+000	7.373e+000	9.533e-001	9.342e-001	2.800e+001	7.900e+001
30	5.627e+000	5.536e+000	1.007e+000	7.069e-001	2.900e+001	8.100e+001
31	4.659e+000	4.595e+000	7.679e-001	5.857e-001	3.000e+001	8.300e+001
32	4.215e+000	4.163e+000	6.571e-001	5.302e-001	3.100e+001	8.500e+001
33	3.629e+000	3.556e+000	7.242e-001	4.561e-001	3.200e+001	8.600e+001
34	3.003e+000	2.996e+000	2.029e-001	3.776e-001	3.300e+001	8.800e+001
35	2.367e+000	2.350e+000	2.825e-001	2.974e-001	3.400e+001	9.000e+001
36	1.732e+000	1.726e+000	1.370e-001	2.176e-001	3.500e+001	9.200e+001
37	6.116e-001	5.750e-001	2.086e-001	0.768e-001	3.600e+001	9.400e+001
38	1.743e+000	1.614e+000	6.602e-001	2.191e-001	3.700e+001	9.600e+001
39	7.487e-001	6.929e-001	2.837e-001	0.941e-001	3.800e+001	9.800e+001
40	6.892e-001	6.876e-001	4.653e-002	0.865e-001	3.900e+001	1.000e+002
41	4.274e-001	2.164e-001	3.686e-001	5.366e-002	4.000e+001	1.020e+002
42	7.398e-001	7.377e-001	5.508e-002	0.929e-001	4.100e+001	1.030e+002
43	8.670e-001	8.670e-001	0.000e+000	1.089e-001	4.200e+001	1.050e+002
44	9.533e-001	9.520e-001	4.880e-002	1.196e-001	4.300e+001	1.070e+002
45	7.492e-001	7.322e-001	1.588e-001	0.940e-001	4.400e+001	1.090e+002
46	7.367e-001	5.965e-001	4.323e-001	0.925e-001	4.500e+001	1.110e+002
47	6.309e-001	4.684e-001	4.227e-001	0.792e-001	4.600e+001	1.130e+002
48	1.043e+000	9.408e-001	4.506e-001	1.310e-001	4.700e+001	1.150e+002
49	9.995e-001	9.819e-001	1.868e-001	1.255e-001	4.800e+001	1.160e+002
50	1.125e+000	7.700e-001	8.203e-001	1.413e-001	4.900e+001	1.180e+002

NASA FINGERPRINT VISCOSITY PROFILE RESIN 91LD NASA LOT 5A USP#36255-19

Q.	ETA* POISE	ETA POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
51	2.676e+000	2.281e+000	1.399e+000	3.357e-001	5.000e+001	1.200e+002

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NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN B-529 NASA LOT5-1



Rheometrics RECAP II

Experiment No. : 1B Sample No. : 1

Title:
NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN B-529 NASA 1015-1

Operator : CP

Date and Time : Wednesday, August 20, 1986 - 14:53:24

Operating Mode : DYNAMIC

Sweep Type : CURE

Geometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

Notes :
STRAIN = 50%
FREQUENCY = 10RAD/SEC

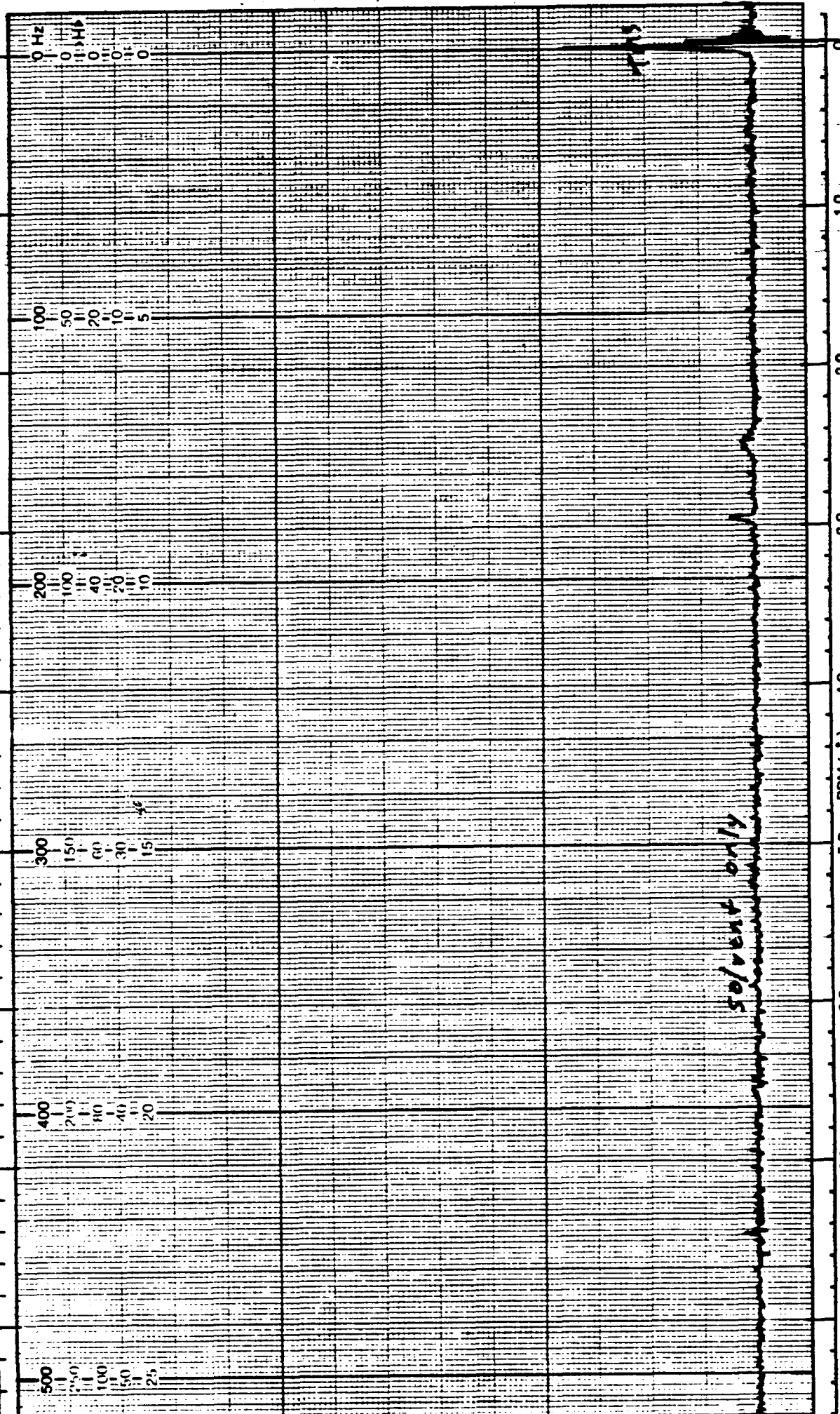
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NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN B-529 NASA LOTS-1

N	ETA* POISE	ETA' POISE	ETA'' POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	7.789e+001	6.991e+001	3.434e+001	9.784e+000	2.000e-001	3.100e+001
2	8.077e+001	7.299e+001	3.459e+001	1.015e+001	1.000e+000	3.100e+001
3	7.750e+001	7.006e+001	3.313e+001	9.741e+000	2.000e+000	3.300e+001
4	7.097e+001	6.359e+001	3.151e+001	8.911e+000	3.000e+000	3.400e+001
5	6.555e+001	5.776e+001	3.098e+001	8.228e+000	4.000e+000	3.600e+001
6	5.879e+001	5.079e+001	2.961e+001	7.385e+000	5.000e+000	3.800e+001
7	5.174e+001	4.347e+001	2.807e+001	6.498e+000	6.000e+000	4.000e+001
8	4.707e+001	3.811e+001	2.763e+001	5.914e+000	7.000e+000	4.100e+001
9	4.239e+001	3.371e+001	2.569e+001	5.316e+000	8.000e+000	4.300e+001
10	3.781e+001	2.958e+001	2.354e+001	4.744e+000	9.000e+000	4.500e+001
11	3.410e+001	2.624e+001	2.178e+001	4.276e+000	1.000e+001	4.700e+001
12	3.050e+001	2.337e+001	1.959e+001	3.828e+000	1.100e+001	4.900e+001
13	2.786e+001	2.142e+001	1.782e+001	3.499e+000	1.200e+001	5.100e+001
14	2.614e+001	2.055e+001	1.616e+001	3.283e+000	1.300e+001	5.300e+001
15	2.461e+001	1.969e+001	1.476e+001	3.088e+000	1.400e+001	5.500e+001
16	2.337e+001	1.889e+001	1.376e+001	2.935e+000	1.500e+001	5.700e+001
17	2.213e+001	1.821e+001	1.258e+001	2.780e+000	1.600e+001	5.900e+001
18	2.089e+001	1.774e+001	1.103e+001	2.622e+000	1.700e+001	6.100e+001
19	1.971e+001	1.706e+001	9.878e+000	2.476e+000	1.800e+001	6.300e+001
20	1.870e+001	1.673e+001	8.348e+000	2.347e+000	1.900e+001	6.500e+001
21	1.730e+001	1.577e+001	7.116e+000	2.173e+000	2.000e+001	6.700e+001
22	1.592e+001	1.469e+001	6.142e+000	1.999e+000	2.100e+001	6.900e+001
23	1.474e+001	1.381e+001	5.153e+000	1.849e+000	2.200e+001	7.000e+001
24	1.324e+001	1.254e+001	4.263e+000	1.663e+000	2.300e+001	7.200e+001
25	1.173e+001	1.116e+001	3.612e+000	1.473e+000	2.400e+001	7.400e+001
26	1.054e+001	1.018e+001	2.713e+000	1.324e+000	2.500e+001	7.600e+001
27	9.284e+000	8.903e+000	2.634e+000	1.166e+000	2.600e+001	7.800e+001
28	7.982e+000	7.796e+000	1.713e+000	1.002e+000	2.700e+001	8.000e+001
29	7.899e+000	7.618e+000	2.088e+000	9.915e-001	2.800e+001	8.200e+001
30	5.610e+000	5.556e+000	7.814e-001	7.046e-001	2.900e+001	8.400e+001
31	4.840e+000	4.720e+000	1.074e+000	6.085e-001	3.000e+001	8.600e+001
32	4.014e+000	3.918e+000	8.754e-001	5.043e-001	3.100e+001	8.800e+001
33	4.170e+000	4.055e+000	9.725e-001	5.238e-001	3.200e+001	9.000e+001
34	4.510e+000	4.388e+000	1.039e+000	5.660e-001	3.300e+001	9.200e+001
35	3.869e+000	3.830e+000	5.468e-001	4.860e-001	3.400e+001	9.400e+001
36	4.165e+000	4.151e+000	3.437e-001	5.228e-001	3.500e+001	9.600e+001
37	3.375e+000	3.375e+000	0.000e+000	4.240e-001	3.600e+001	9.800e+001
38	2.913e+000	2.853e+000	5.878e-001	3.657e-001	3.700e+001	1.000e+002
39	2.599e+000	2.564e+000	4.254e-001	3.265e-001	3.800e+001	1.020e+002
40	2.449e+000	2.422e+000	3.624e-001	3.073e-001	3.900e+001	1.040e+002
41	1.715e+000	1.668e+000	4.016e-001	2.154e-001	4.000e+001	1.060e+002
42	8.310e-001	8.087e-001	1.912e-001	1.044e-001	4.100e+001	1.080e+002
43	5.974e-001	5.924e-001	0.772e-001	0.750e-001	4.200e+001	1.090e+002
44	7.072e-001	3.329e-001	6.240e-001	0.889e-001	4.300e+001	1.120e+002
45	1.220e+000	7.795e-001	9.381e-001	1.531e-001	4.400e+001	1.140e+002
46	1.471e+000	1.185e+000	8.718e-001	1.848e-001	4.500e+001	1.160e+002
47	2.187e+000	1.749e+000	1.313e+000	2.744e-001	4.600e+001	1.180e+002
48	1.998e+000	1.963e+000	3.708e-001	2.509e-001	4.700e+001	1.200e+002
49	2.668e+000	2.504e+000	9.216e-001	3.348e-001	4.800e+001	1.220e+002
50	4.289e+000	4.132e+000	1.150e+000	5.386e-001	4.900e+001	1.230e+002

ORIGINAL PAGE IS
OF POOR QUALITY



SOLVENT ONLY
SCAN

ORIGINAL PAGE IS
OF POOR QUALITY

SPECTRUM NO. 1A of 7
solvent scan

REMARKS:

SAMPLE: Solvent

SOLVENT: Unisol-d + 0.627%

DEC. LEVEL: _____

AUTO ☐ (250)
(500)
(2)
(.05)

MANUAL

SWEEP TIME (SEC): 0.20 0.50 1.00

SWEEP WIDTH (Hz): 25 50 100 200 400

FILTER: 1 2 3 4 5 6 7 8

RF POWER LEVEL: 0.30

SWEEP OFFSET (Hz): 0

SPECTRUM AMPLITUDE: 2.0

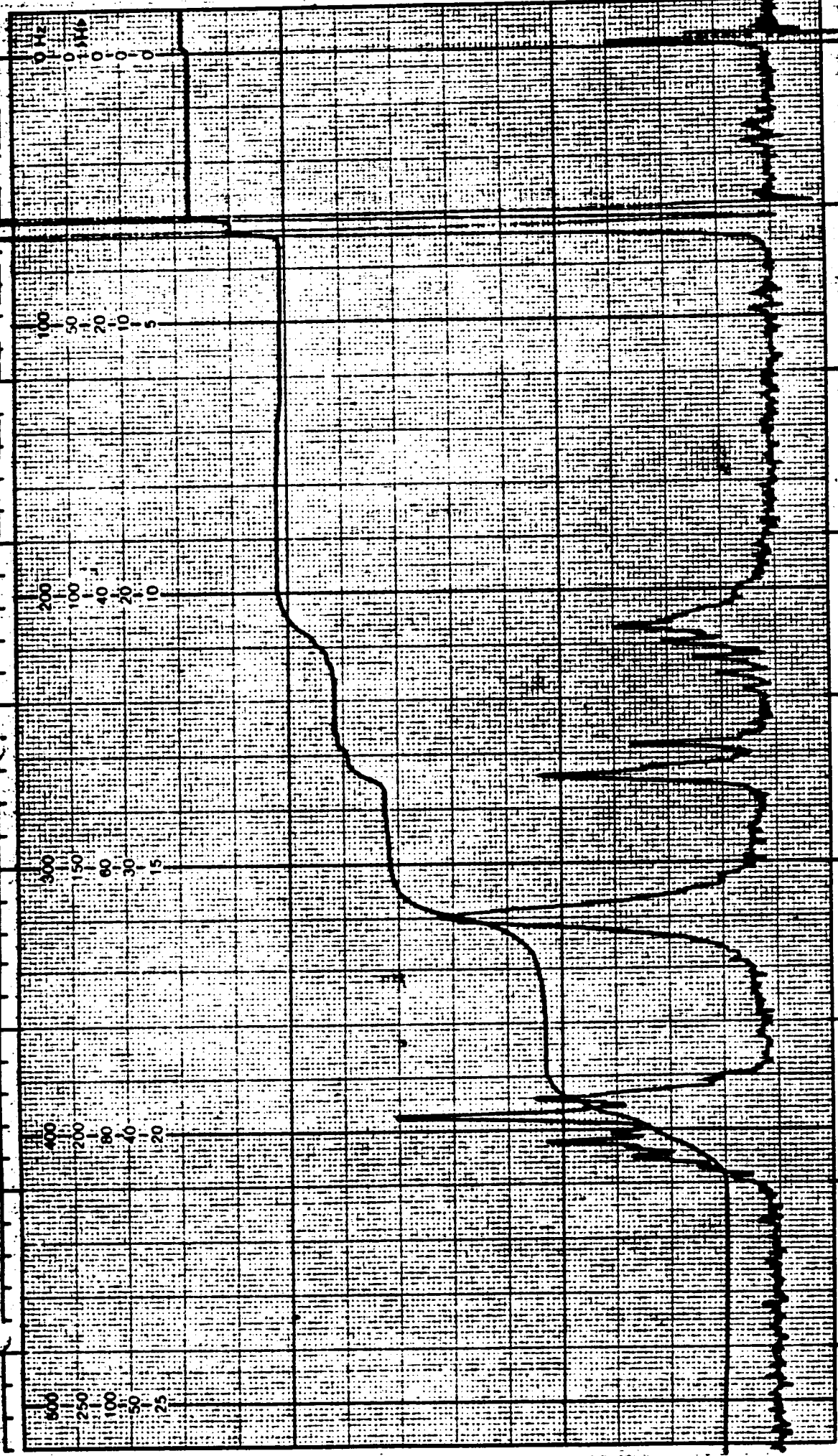
INTEGRAL AMPLITUDE: 1

SPINNING RATE (RPS): 30

OPERATOR DGW

DATE: 3-21-86

NORELL, INC.
LANDISVILLE, N.J. 08326
T60 Phone: (609) 697-0020



REMARKS: 0.160 gm sample
0.985 gm solvent

SAMPLE: 91LD 5AB-695
SOLVENT: Methyl-d + 0.5% TMS
DEC. LEVEL: _____

MANUAL ☒ AUTO ☐
SWEEP TIME (SEC): 20 (250)
SWEEP WIDTH (Hz): 25 (500)
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.80 (0.05)

SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 1.0
INTEGRAL AMPLITUDE: 3.0
SPINNING RATE (RPS): 30

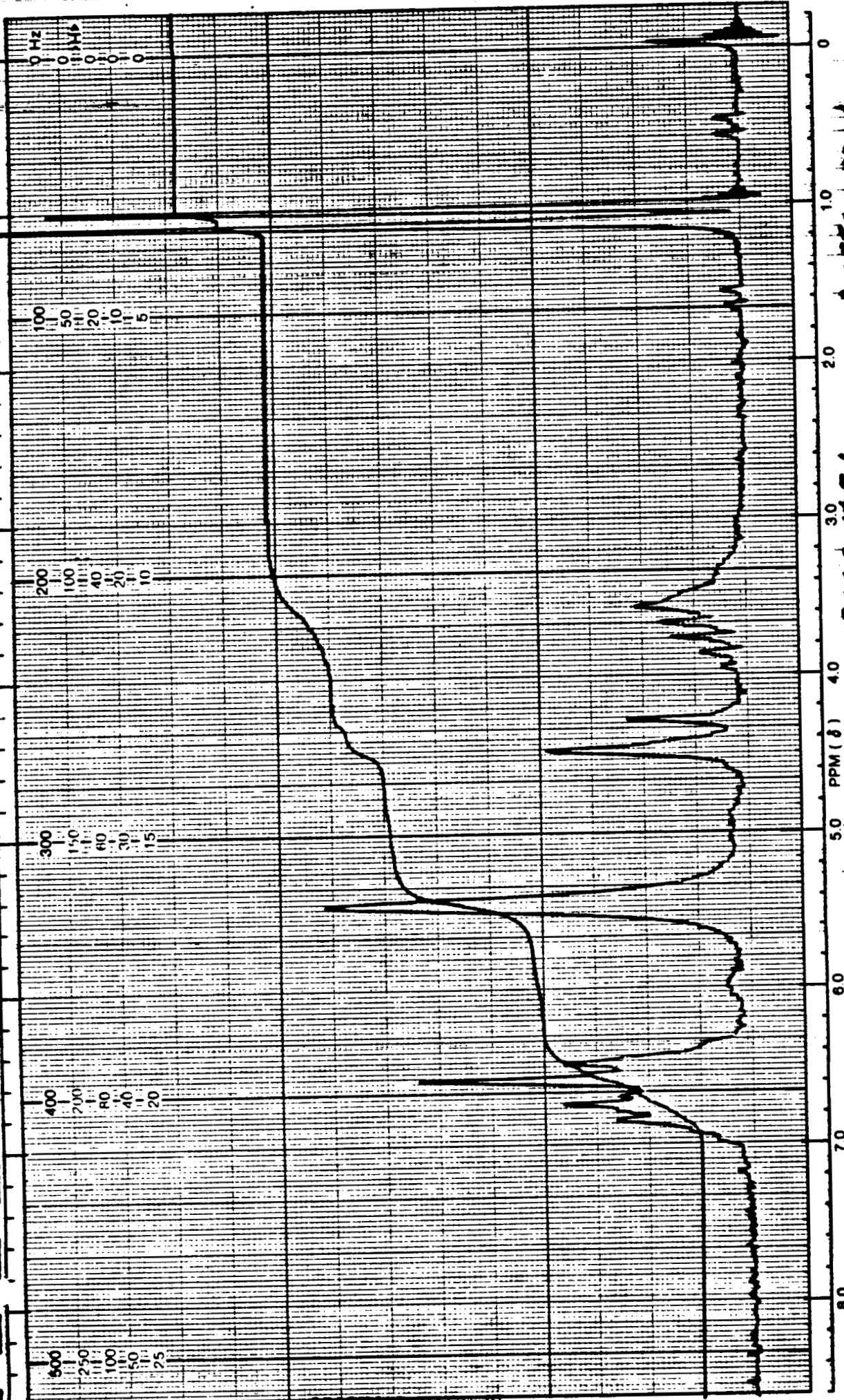
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OF POOR QUALITY

SPECTRUM NO. 1 of 1 91LD
5A B-695

OPERATOR D6W

DATE: 7-6-76

NORELL, INC.
LANDISVILLE, N.J. 08326
Phone: (609) 697-0020



REMARKS:
 SAMPLE: 0.155 gm sample
 SOLVENT: 0.625 gm solvent
 DEC. LEVEL: _____

SAMPLE: 9140 45-1
 SOLVENT: d₂O + 0.5% TMS
 DEC. LEVEL: _____

AUTO ☐
 (250)
 (500)
 (2)
 (.05)

MANUAL
 SWEEP TIME (SEC): 30 100 300 1000
 SWEEP WIDTH (Hz): 25 50 100 200 500
 FILTER: 1 2 3 4 5 6 7 8
 RF POWER LEVEL: 0.50

SWEEP OFFSET (Hz): 0
 SPECTRUM AMPLITUDE: 6.3
 INTEGRAL AMPLITUDE: 5.0
 SPINNING RATE (RPS): 3.0

SPECTRUM NO. 9140 45-1

OPERATOR DCW

DATE: 6-19-86

NORELL, INC.
 LANDISVILLE, N.J. 08326
 Phone: (609) 697-0020

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FABRIC TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

CCA-3 Fabric for NASA Lot# 5

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1b. Breaking Strength, FILL.....	1
2a. Carbon Assay.....	1
2b. Hydrogen Assay.....	1
2c. Nitrogen Assay.....	1
3. Visual Inspection.....	1
4. Specific Gravity.....	1
5. pH.....	1
6. TGA.....	1
7a. Atomic Absorption.....	2
7b. Moisture Content.....	2
7c. Ash Content.....	2
8a. Filament diameter, WARP.....	2
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9a. Thread Count, WARP.....	2
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10a. Areal weight.....	2
10b. Volatiles.....	2
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CHARTS

Visual Inspection.....	3A
TGA.....	6A



FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

CCA-3 Fabric for NASA Lot# 5

1a. Breaking Strength, lbs/in, WARP ASTM D1682	PICK CENTER PLAIN AVG.	<u>#5-1</u> 35 44 39 39.3
1b. Breaking Strength, lbs/in, FILL ASTM D1682	PICK CENTER PLAIN AVG.	27 28 29 28.0
2a. Carbon Assay, % MDQAI 5560	PICK CENTER PLAIN AVG.	96.2 96.4 96.3 96.30
2b. Hydrogen Assay, % MDQAI 5560	PICK CENTER PLAIN AVG.	.16 .14 .14 .147
2c. Nitrogen Assay, % MDQAI 5560	PICK CENTER PLAIN AVG.	.8 .8 .8 .80
3. Visual Inspection QC1-102	See Charts 3A	
4. Specific Gravity, Units PTM-84		2.4696 2.3812 <u>2.4216</u> AVG. 2.424
(NOTE: Results are not reliable due to surface activity)		
5. pH, Units CTM-24B		6.9 <u>6.9</u> AVG. 6.90
6. TGA, °C at 50% Weight Loss CTM-51 (AIR)	SET UP #2 #5-1 592	

See Chart 6A

CCA-3 Fabric for NASA Lot# 5

7a. Atomic Absorption, ppm CTM-53B		<u>#5-1</u>
	Na	538
	K	42
	Ca	9
	Mg	60
	Li	<u>0</u>
	AVG.	649
7b. Moisture Content, % CTM-53B	#5-1	6.29
7c. Ash Content, % CTM-53B	#5-1	.195
8a. Filament diameter, microns, WARP S.E.M. procedure (diameters are an average 10 measurements)		<u>#5-1</u>
	AVERAGE	12.09
	Minimum	8.35
	Maximum	16.00
	Std. Dev	2.35
8b. Filament diameter, microns, FILL S.E.M. procedure (diameters are an average of 10 measurements)		<u>#5-1</u>
	AVERAGE	11.58
	Minimum	10.40
	Maximum	13.00
	Std. Dev	1.01
9a. Thread Count, per inch, WARP PTM-5A		<u>#5-1</u>
		53
		53
		54
		53
		<u>53</u>
	AVG.	53.2
9b. Thread Count, per inch, FILL PTM-5A		49
		49
		48
		49
		<u>50</u>
	AVG.	49.0
10a. Areal weight as received, gm/4x4 PTM-3A		
	LEFT	2.941
	CENTER	2.961
	RIGHT	<u>2.985</u>
	AVG.	2.962
10b. Volatiles as received, % PTM-3A		
	LEFT	6.22
	CENTER	6.45
	RIGHT	<u>6.53</u>
	AVG.	6.40

CCA-3 Fabric for NASA Lot# 5

10c. Weight Change on Acetone Wash, %		#5-1
PTM-3A	LEFT	-.80
	CENTER	.14
	RIGHT	-.04
	AVG.	-.23

U.S. Polymeric



Hamid M. Quraishi, Manager
Quality Assurance Department

(NASA) DATE 6/6/86

FOOTAGE

START Sample

LEFT

FABRIC OCA-3-43"

MFG. HITCO

ROLL NO. 18489

YARDS 31

POUNDS 19

ORDER NO. 71108

SPECIFICATION STWY 3184-SCN2

Q.C. FILE # NASA 5-1

SYMBOLS



- TEAR



- SPOTS OR STAINS



- FOLDS



- EDGE CURL



- TIGHT WEAVE OR SELVAGE



- WEAVE DISTORTION



- VISIBLE PUCKERS



- ONE PUCKER CREASING



- TWO OR MORE CREASINGS

REMARKS

NASA Roll # 5-1

START only

GRADE Group A

GARCIA

TREATMENT OPERATOR READ UP

10		
20		
30		
40		
50		
60	W	
70		
80		
90		
100	93- END	NASA 5-1
110		
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140		
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180		
190		
200		
210		
220		
230		
240		
250		

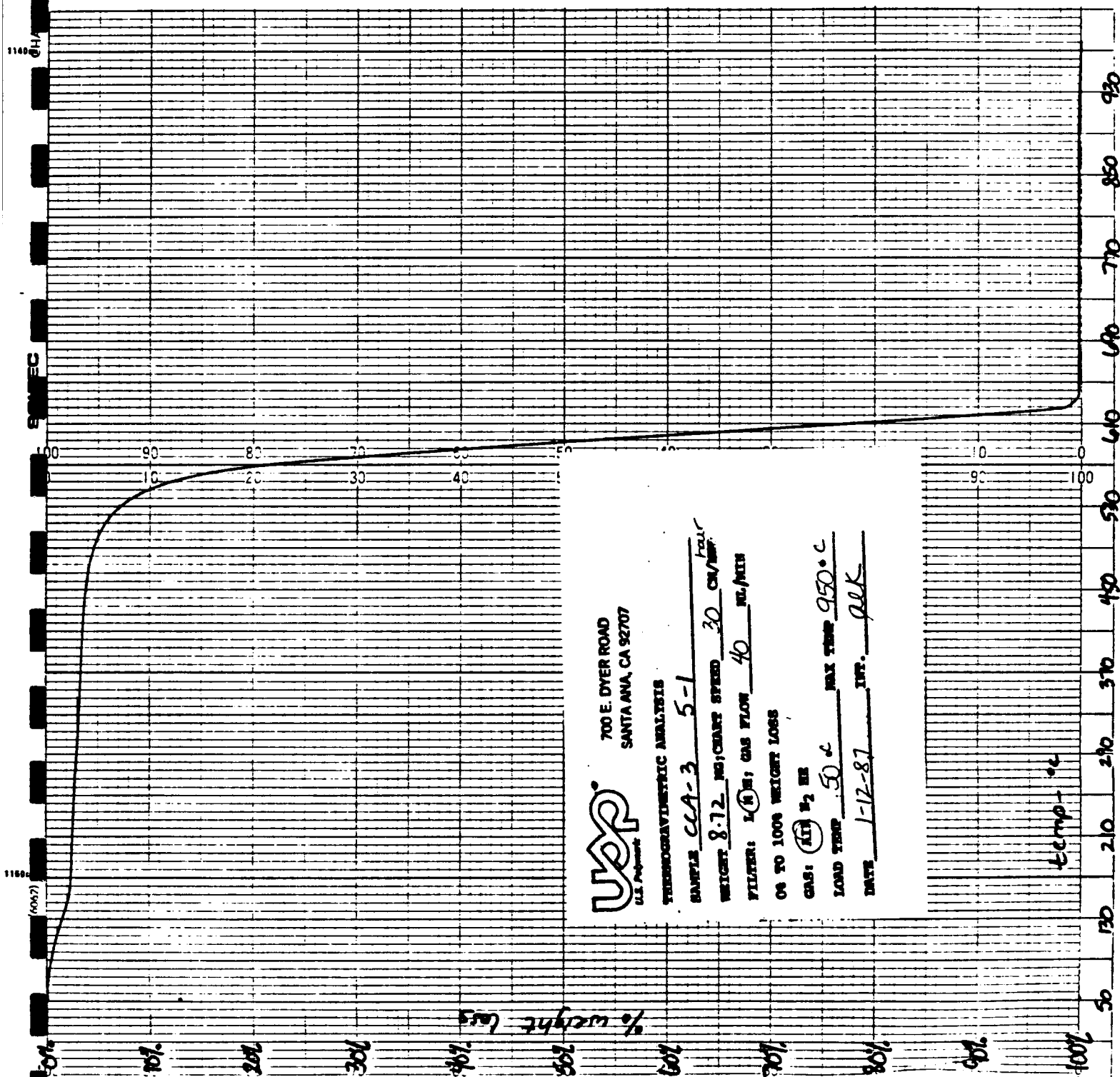


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NAS8-36298

U.S. Polymeric O.E. 71108

FM 5055B NASA LOT# 5 U.S.P. LOT# D09335

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PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5055B NASA LOT# 5 U.S.P. LOT# D09335

	<u>ROLL#1-S</u>	<u>ROLL#2-S</u>
1a. Resin Content, Soxhlet, % CTM-6D	34.3	32.6
	34.4	33.3
	<u>35.4</u>	<u>34.3</u>
AVG.	34.7	33.4
NASA LOT# 5 AVERAGE	34.1	
1b. Filler Content, Soxhlet, % CTM-6D	14.8	14.1
	14.9	14.4
	<u>15.3</u>	<u>14.8</u>
AVG.	15.0	14.4
NASA LOT# 5 AVERAGE	14.7	
1c. Cloth Content, Soxhlet, % CTM-6D	50.9	53.3
	50.7	52.3
	<u>49.3</u>	<u>50.9</u>
AVG.	50.3	52.2
NASA LOT# 5 AVERAGE	51.2	
2. Volatile Content, % PTM-17B	4.2	4.2
	4.4	4.1
	<u>4.4</u>	<u>4.5</u>
AVG.	4.3	4.3
NASA LOT# 5 AVERAGE	4.3	
3. Flow, % PTM-19G	17.9	19.9
	18.2	18.7
	<u>16.9</u>	<u>22.0</u>
AVG.	17.7	20.2
NASA LOT# 5 AVERAGE	18.9	
4. Resin Content, Dry basis, % PTM-16F, Type II	33.5	34.9
	34.2	33.3
	<u>34.1</u>	<u>35.3</u>
AVG.	33.9	34.5
NASA LOT# 5 AVERAGE	34.2	
5. Tack, lbs PTM-80	35	27
NASA LOT# 5 AVERAGE	31	
6. Gel Time, seconds PTM-20E	58	50
NASA LOT# 5 AVERAGE	54	

FM 5055B NASA LOT# 5 U.S.P. LOT# D09335

7a. Atomic Absorption, ppm		<u>ROLL#1-S</u>	<u>ROLL#2-S</u>	<u>LOT#5 AVG.</u>
CTM-53B	Na	248	249	249
	K	29	23	26
	Ca	2	2	2
	Mg	3	5	4
	Li	<u>0</u>	<u>0</u>	<u>0</u>
	TOTAL	282	279	281

7b. Moisture Content, %		<u>ROLL#1-S</u>	<u>ROLL#2-S</u>
CTM-53B		6.19	6.14
	NASA LOT# 5 AVERAGE	6.16	

7c. Ash Content, %		.14	.12
CTM-53B			
	NASA LOT# 5 AVERAGE	.13	

8. TGA, % Weight Loss at 500°C		8.0	7.4
CTM-51 (Nitrogen)			
	NASA LOT# 5 AVERAGE	7.7	

See chart 8A-8B

9. DSC, °C		<u>ROLL#1-S</u>	<u>ROLL#2-S</u>	<u>LOT#5 AVG.</u>
CTM-50A	First Temp	179	178	179
	Second Temp	240	239	240

See Chart 9A-9B

10. Infrared (IRZB) Baseline		1.14	1.13	1.13
CTM-21C				

See Chart 10A-10B

11. Environmental History	Date manufactured: 25 July 1986
	Packaged in: Polyethylene bag
	Date shipped: Test lot not shipped

12. Specific Gravity, Cured, Units		<u>ROLL#1-S</u>	<u>ROLL#2-S</u>
ASTM D792		1.478	1.467
		1.478	1.456
		<u>1.478</u>	<u>1.475</u>
	AVG.	1.478	1.466
	NASA LOT# 5 AVERAGE	1.472	

13a. Tensile Strength, ksi, WARP		22.28	23.12
FTMS 406-1011		20.79	22.08
		23.35	22.73
		24.20	22.45
		<u>23.07</u>	<u>20.70</u>
	AVG.	22.74	22.22
	NASA LOT# 5 AVERAGE	22.48	

FM 5055B NASA LOT# 5 U.S.P. LOT# D09335

13b. Tensile Modulus, **msi**, WARP
FTMS 406-1011

	<u>ROLL#1-S</u>	<u>ROLL#2-S</u>
	2.91	2.92
	3.06	2.99
	2.85	3.09
	2.98	3.00
	<u>2.93</u>	<u>2.99</u>
AVG.	2.91	3.00
NASA LOT# 5 AVERAGE	2.95	

13c. Tensile Elongation, **%**, WARP
FTMS 406-1011

	1.16	1.20
	1.05	1.07
	1.22	1.10
	1.26	1.10
	<u>1.19</u>	<u>1.02</u>
AVG.	1.18	1.10
NASA LOT# 5 AVERAGE	1.14	

14a. Flexural Strength, **ksi**, WARP
FTMS 406-1031

	33.18	37.31
	32.83	33.71
	34.63	32.79
	34.86	33.79
	<u>34.95</u>	<u>34.73</u>
AVG.	34.09	34.47
NASA LOT# 5 AVERAGE	34.28	

14b. Flexural Modulus, **msi**, WARP
FTMS 406-1031

	2.79	2.53
	2.63	2.68
	2.68	2.55
	2.82	2.53
	<u>2.84</u>	<u>2.58</u>
AVG.	2.75	2.57
NASA LOT# 5 AVERAGE	2.66	

15a. Compressive Strength, **ksi**, WARP
FTMS 406-1021

	50.05	57.62
	53.17	55.43
	53.17	58.81
	52.72	59.01
	<u>55.37</u>	<u>60.59</u>
AVG.	52.90	58.31
NASA LOT# 5 AVERAGE	55.60	

15b. Compressive Modulus, **msi**, WARP
FTMS 406-1021

	2.99	2.87
	2.97	2.93
	2.98	2.91
	2.97	2.87
	<u>3.01</u>	<u>2.92</u>
AVG.	2.98	2.90
NASA LOT# 5 AVERAGE	2.94	

C-2

FM 5055B NASA LOT# 5 U.S.P. LOT# D09335

	<u>ROLL#1-S</u>	<u>ROLL#2-S</u>
16. Double Shear Strength, ksi FTMS 406-1041A	4.80	3.77
	4.80	4.40
	4.43	5.14
	3.77	4.63
	<u>4.40</u>	<u>5.70</u>
AVG.	4.44	4.73
NASA LOT# 5 AVERAGE	4.58	
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)	71.5	72.9
	NASA LOT# 5 AVERAGE 72.2	
18. Residual Volatiles, % PTM-98	1.39	1.54
	1.39	1.67
	<u>1.41</u>	<u>1.59</u>
AVG.	1.39	1.60
NASA LOT# 5 AVERAGE	1.50	
19. Resin Content, Pyrolysis, % CTM-14B	33.11	36.32
	33.64	36.69
	<u>29.84</u>	<u>37.20</u>
AVG.	32.20	36.74
NASA LOT# 5 AVERAGE	34.47	
20. Acetone Extraction, % CTM-18A	2.33	2.40
	3.08	2.41
	<u>2.39</u>	<u>3.41</u>
AVG.	2.60	2.74
NASA LOT# 5 AVERAGE	2.67	
21a. CTE, in/in °F with PLY PTM-61B	3.93	5.65
	<u>3.33</u>	<u>4.34</u>
AVG.	3.63	5.00
NASA LOT# 5 AVERAGE	4.31	
21b. CTE, in/in °F Cross PLY PTM-61B	4.21	6.61
	<u>4.68</u>	<u>6.45</u>
AVG.	4.45	6.53
NASA LOT# 5 AVERAGE	5.49	

See Chart 21A-21B

U.S. Polymeric

Hamid M. Quraishi
 Hamid M. Quraishi, Manager
 Quality Assurance Department

ELMER CHART NO. 056-7300

PERKIN-EL



700 E. DYER ROAD
SANTA ANA, CA 92707

THERMOGRAVIMETRIC ANALYSIS:

SAMPLE DO8335-1 WT 20.9 MG
HEAT RATE 20 °C/MIN. CHART SPEED
0.5 CM/MIN. - 08 TO 100% WEIGHT LOSS,
0-1000°C - FILTER 1 (H) E GAS LOW
40 ml/min.

GAS AIR (2) He

MAX. TEMP. 950
DATE 10-10-86 INT. ALK
W = WEIGHT CHANGE TC = THERMOCOUPLES

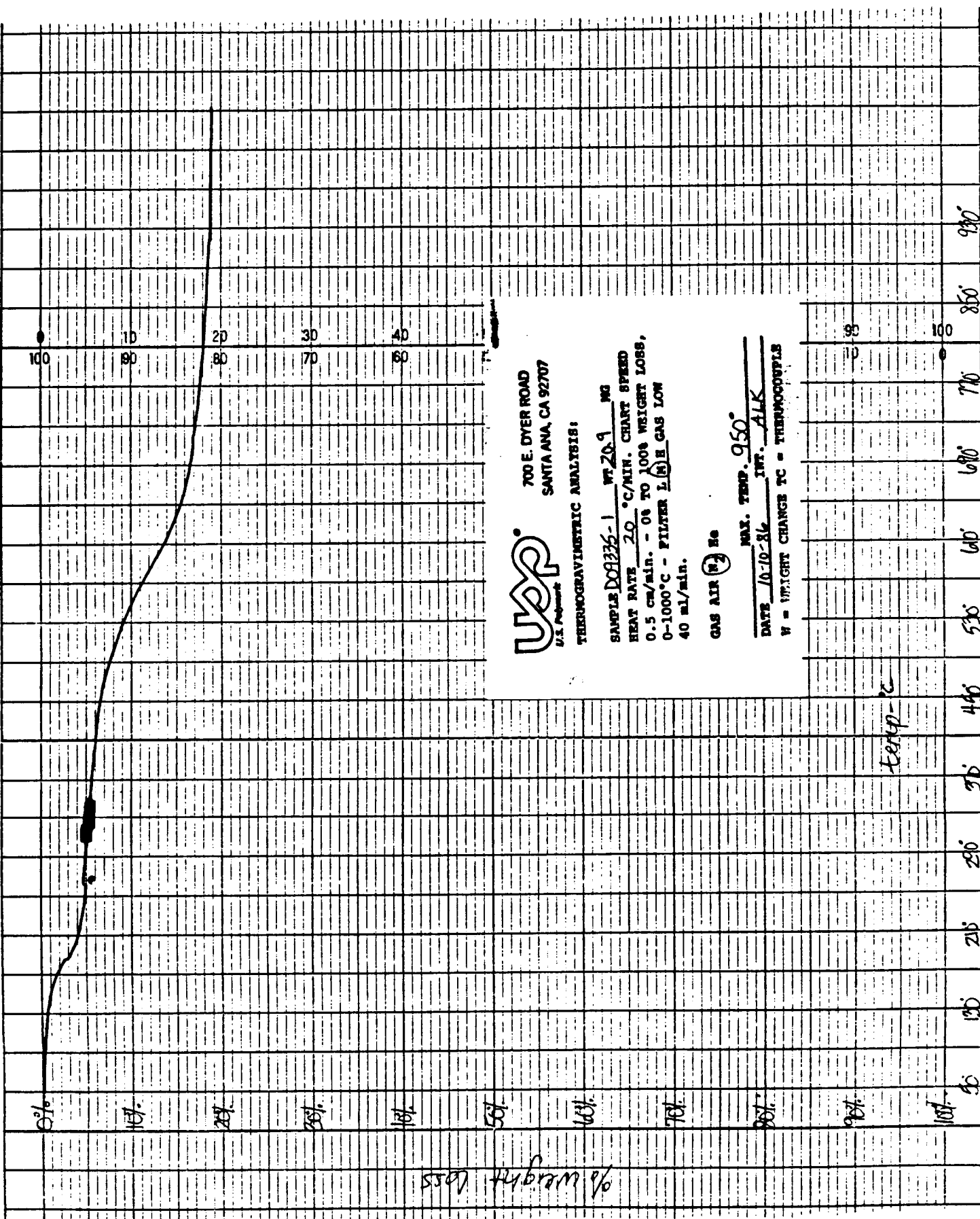
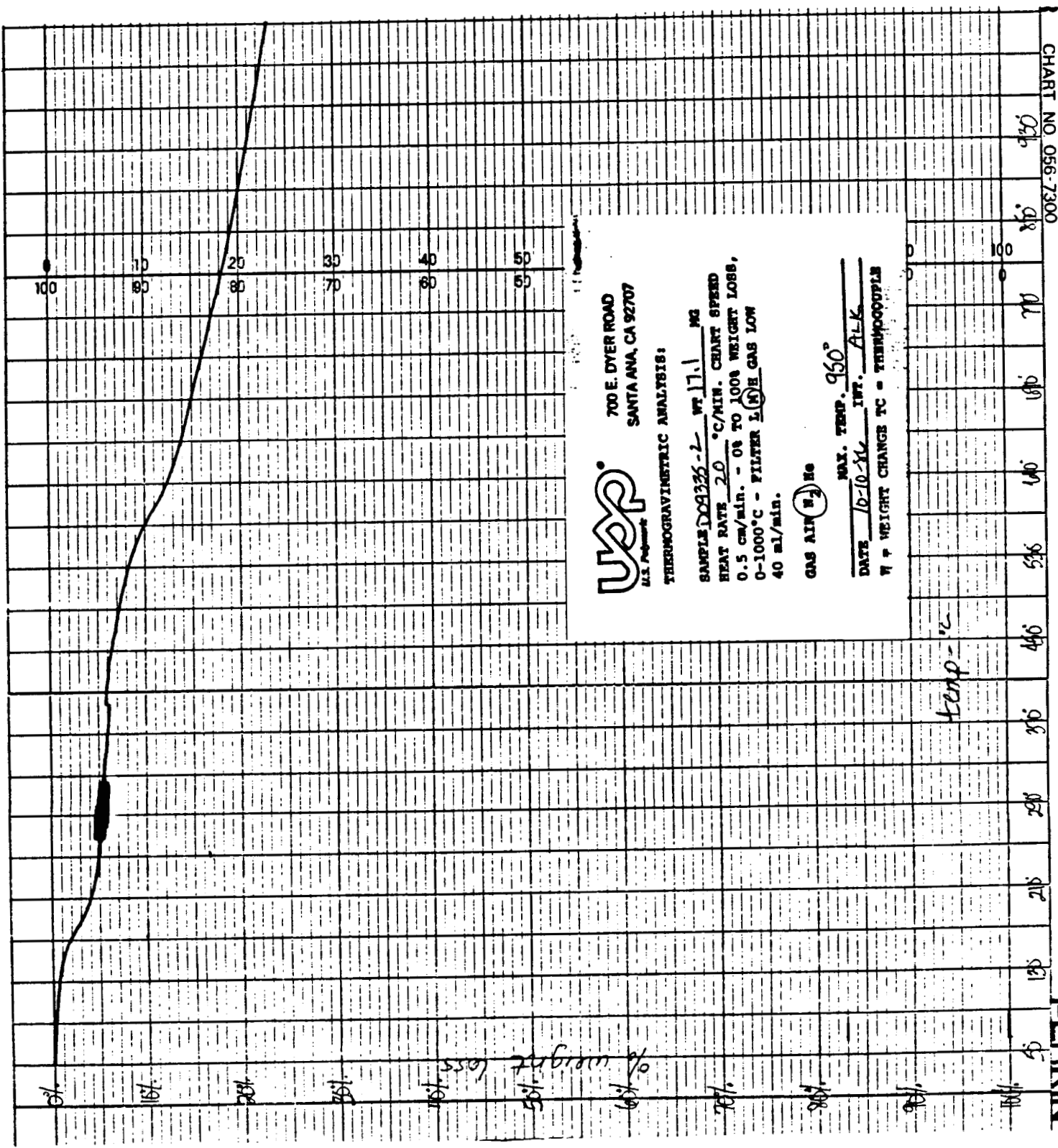


CHART NO. 056-7300

PERKIN-



700 E. DYER ROAD
SANTA ANA, CA 92707

UAP
THERMOGRAVIMETRIC ANALYSIS:

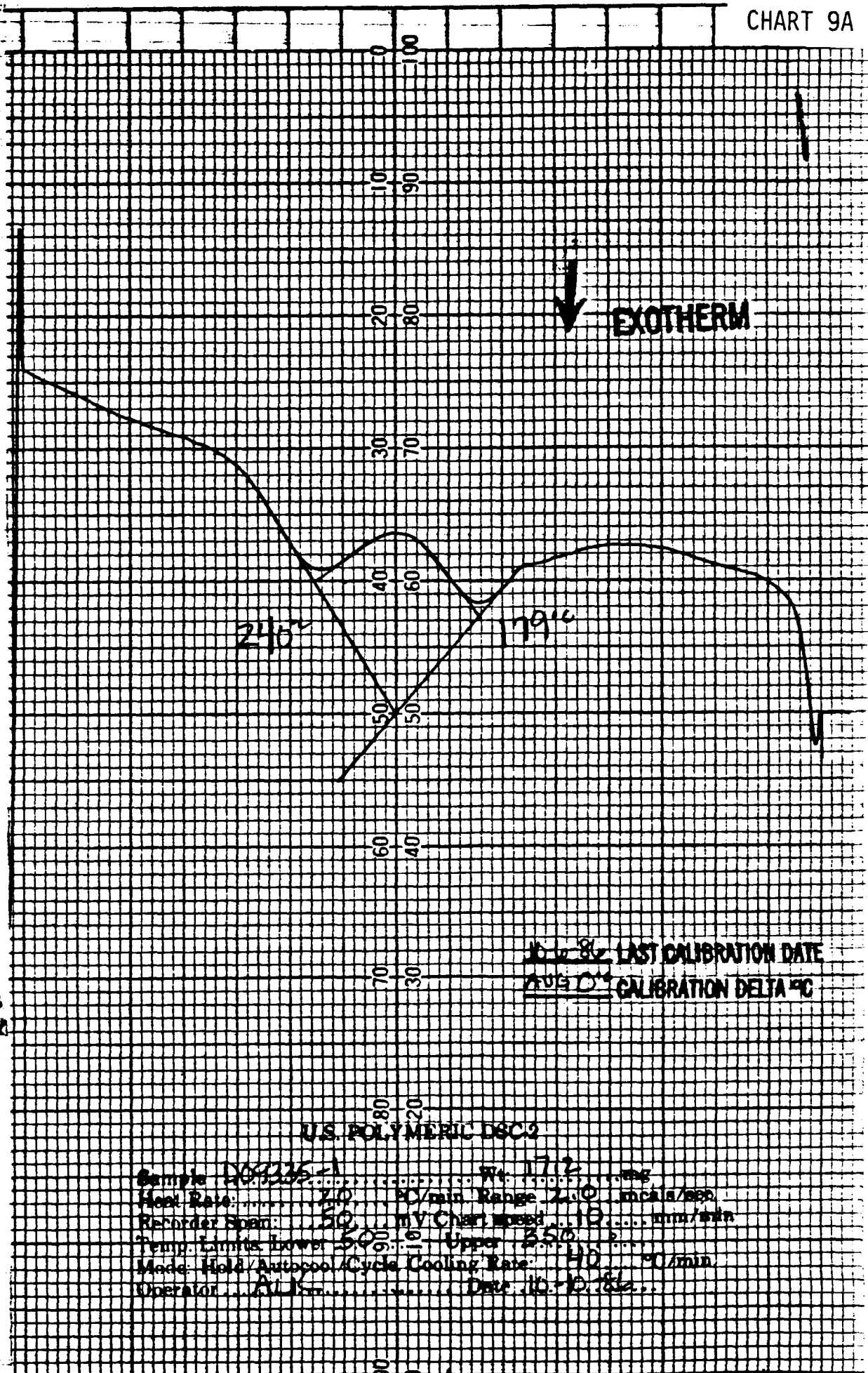
SAMPLE D8335-2 WT 17.1 MG
HEAT RATE 2.0 °C/MIN. CHART SPEED
0.5 CM/MIN. - 08 TO 1008 WEIGHT LOSS,
0-1000°C - FILTER 1.0 µM GAS LOW
40 ml/min.

GAS AIR N₂ He

MAX. TEMP. 950
DATE 10-10-86 INT. ALK
W * WEIGHT CHANGES TC = THERMOCOUPLE

temp - °C

% weight loss



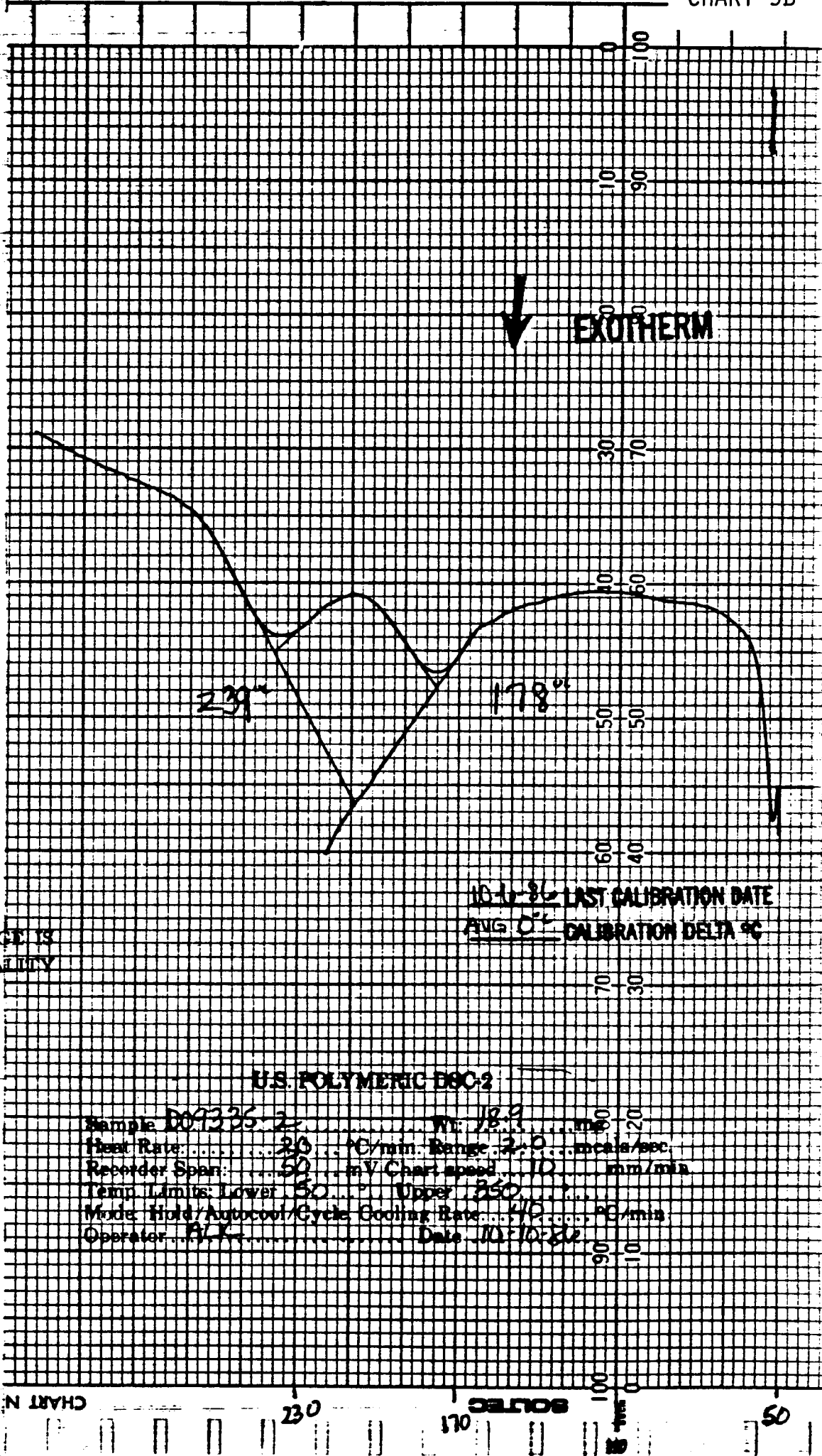
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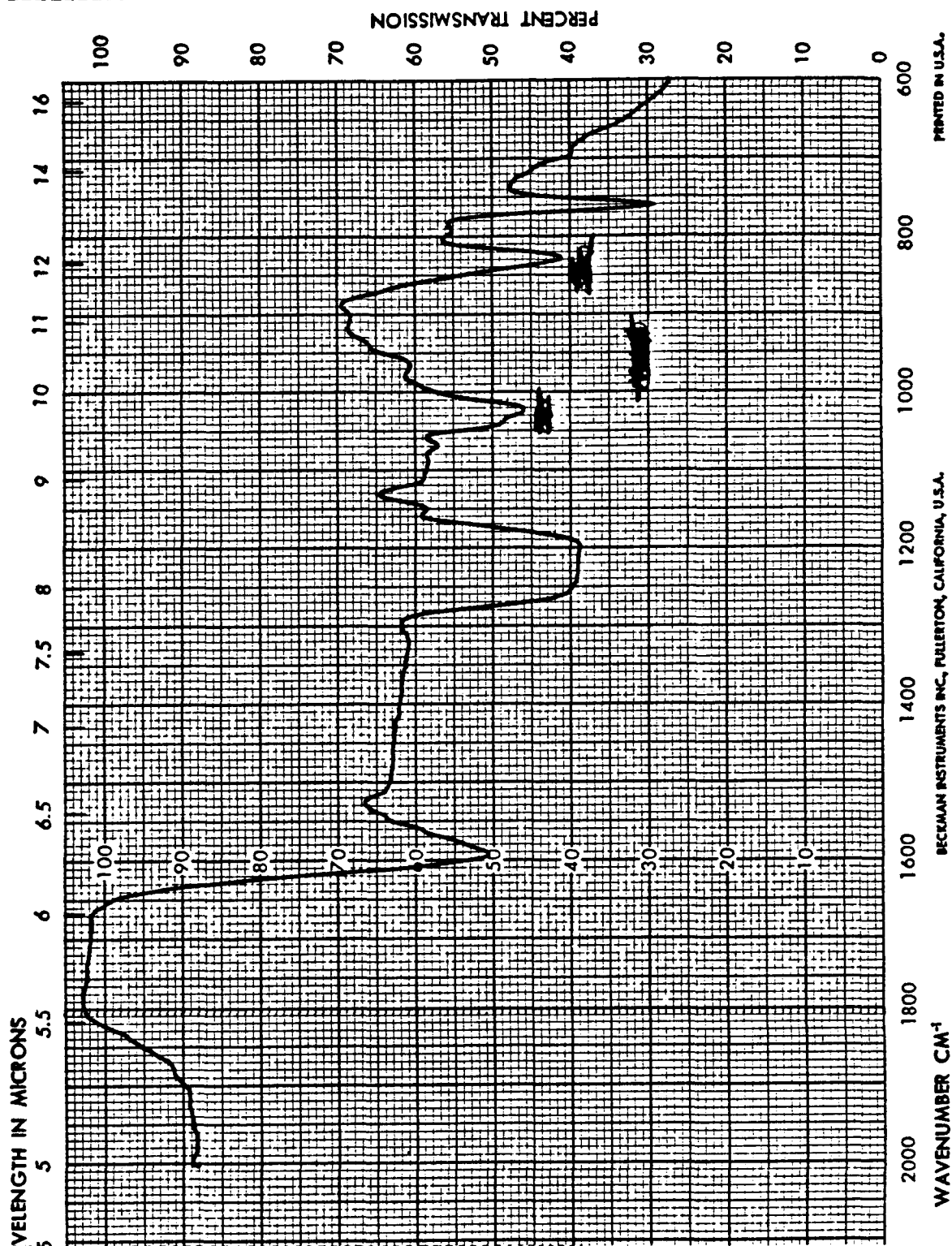
10-10-82 LAST CALIBRATION DATE
AUG 10 1982 CALIBRATION DELTA °C

U.S. POLYMERIC DSC2

Sample D69335-1 Wt. 17.2 mg
Heat Rate: 20 °C/min Range 2.0 mcal/sec
Recorder Span: 50 mV Chart speed: 10 mm/min
Temp. Limits: Lower 50.0 °C Upper 250.0 °C
Mode: Hold/Autocool Cycle Cooling Rate: 40 °C/min
Operator: AUK Date: 10-10-82

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WAVENUMBER CM⁻¹

BECKMAN INSTRUMENTS INC., FULLERTON, CALIFORNIA, U.S.A.

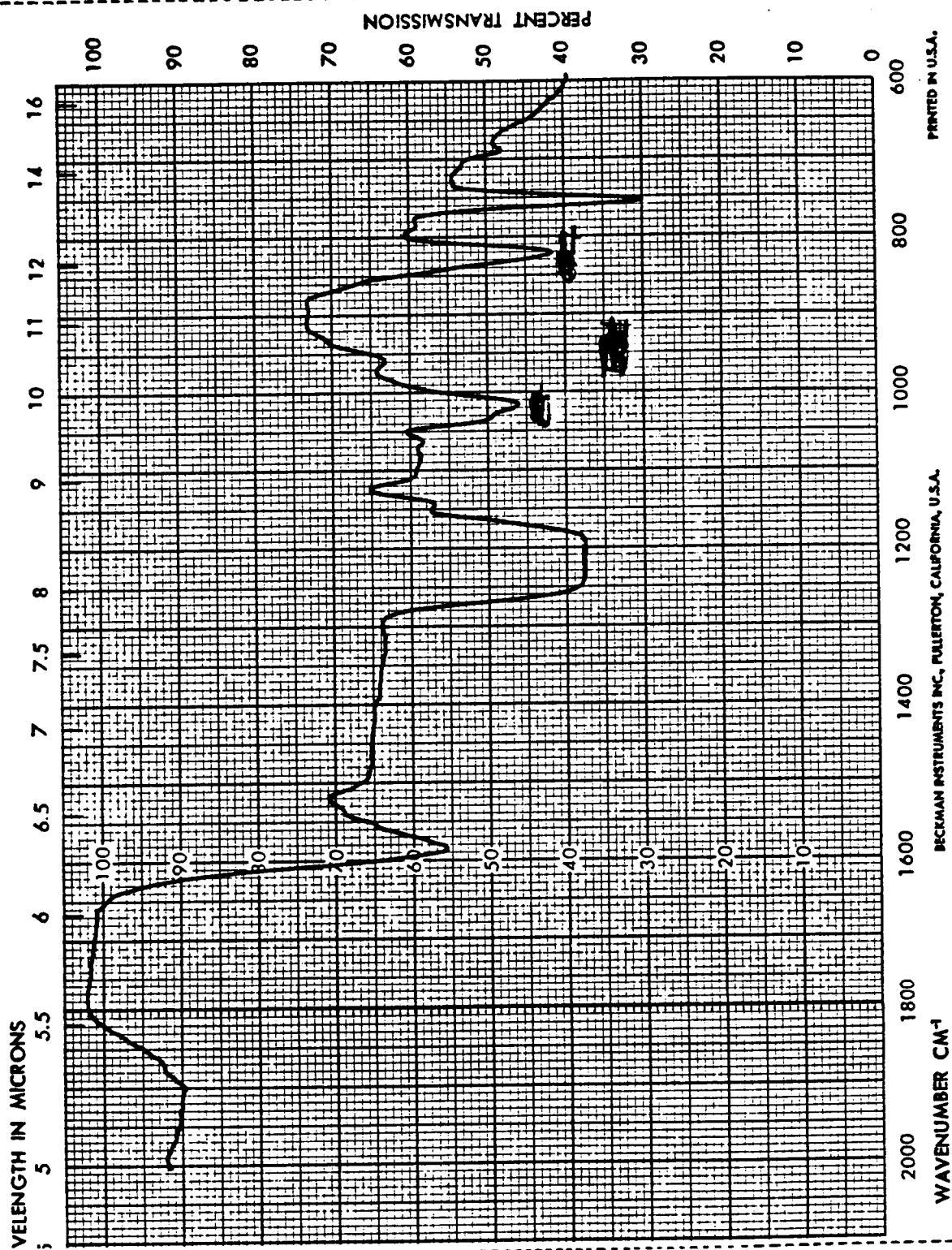
PRINTED IN U.S.A.

SPECTRUM NO. 15300
 DATE 8-08-86
 SAMPLE FM-5055 B
DO9335 #1
 SOURCE _____
 STRUCTURE _____

PATH 0.2 mm NaCl
 SOLVENT ACETONE
 CONCENTRATION 40-45%
 PHASE LIQUID
 COMMENTS _____

ANALYST Y. MIRANDA
Beckman®

 INFRARED
 SPECTROPHOTOMETER



SPECTRUM NO. 15301
 DATE 8-8-64
 SAMPLE FM 5055 B
DD9335 #2

SOURCE _____

STRUCTURE _____

PATH 0.2 mm KACl
 SOLVENT ACETONE
 CONCENTRATION 40-45%
 PHASE LIQUID
 COMMENTS _____

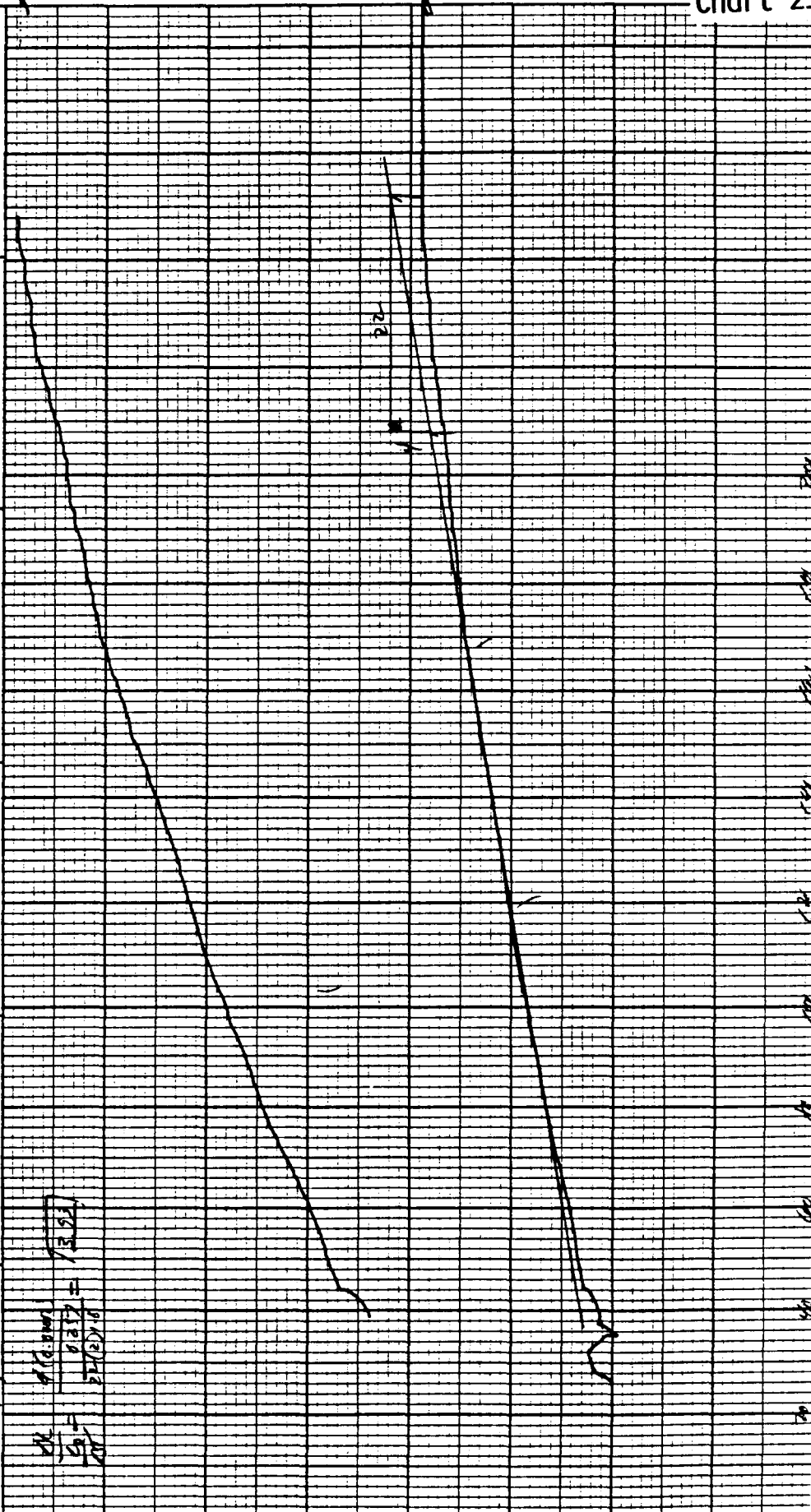
ANALYST V. MIRANDA

Beckman®

INFRARED
SPECTROPHOTOMETER

PART NO. 990088

RUN NO. _____	DATE <u>12/13/84</u>	T-AXIS	DTA-DSC	TGA	TMA
OPERATOR <u>JA</u>	SCALE, °C/in. <u>20</u>	SCALE, °C/in. _____	SCALE, mg/in. _____	SCALE, mg/in. <u>0.1/0.1</u>	SCALE, mg/in. <u>0.1/0.1</u>
SAMPLE: <u>DOS 355-1-(1)</u>	PROG. RATE, °C/min. <u>10</u>	(mcal/sec)/in. _____	SUPPRESSION, mg _____	MODE <u>600/200/100</u>	MODE <u>600/200/100</u>
ATM <u>Atm</u>	HEAT <u>COOL</u>	WEIGHT, mg _____	WEIGHT, mg _____	SAMPLE SIZE <u>0.25g</u>	SAMPLE SIZE <u>0.25g</u>
FLOW RATE <u>3.55cc/min</u>	SHIFT, in. <u>0</u>	REFERENCE _____	TIME CONST., sec _____	LOAD, g <u>11</u>	LOAD, g <u>11</u>
			dY, (mg/min)/in. _____	dY, (10X), (mg/min)/in. _____	dY, (10X), (mg/min)/in. _____



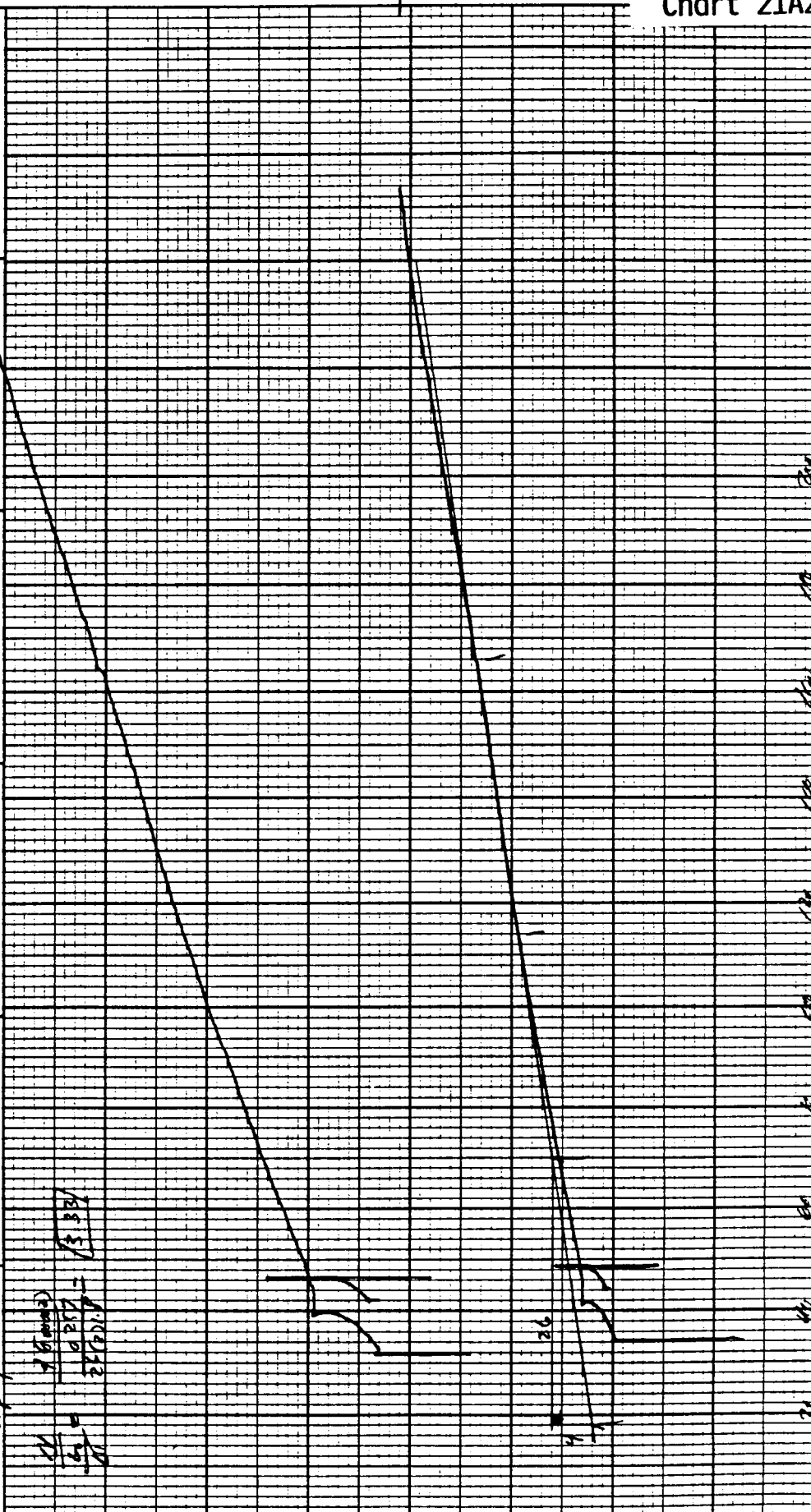
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MEASURED VARIABLE

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PART NO. 990008

RUN NO. <u>121316</u> OPERATOR <u>PT</u> SAMPLE <u>D01335-1-2</u> ATM <u>4.8</u> @ <u>500</u> FLOW RATE <u>3.55SL</u>		T-AXIS SCALE: °C/in <u>50</u> <u>20</u> PROG. RATE: °C/min <u>1</u> HEAT <input checked="" type="checkbox"/> COOL <input type="checkbox"/> ISO <input type="checkbox"/> SHIFT: in <u>0</u>		DTA-DSC SCALE: °C/in _____ (mcal/sec)/in _____ WEIGHT, mg _____ REFERENCE _____		TGA SCALE, mg/in _____ SUPPRESSION, mg _____ WEIGHT, mg _____ TIME CONST., sec _____ dY, (mg/min)/in _____		TMA <u>4.8</u> (in/in) SCALE, mils/in <u>0.1</u> <u>0.2</u> MODE <u>KL</u> <u>PL</u> <u>AL</u> <u>SL</u> SAMPLE SIZE <u>0.257</u> LOAD, g <u>0</u> dY, (10X), (mils/min)/in _____	
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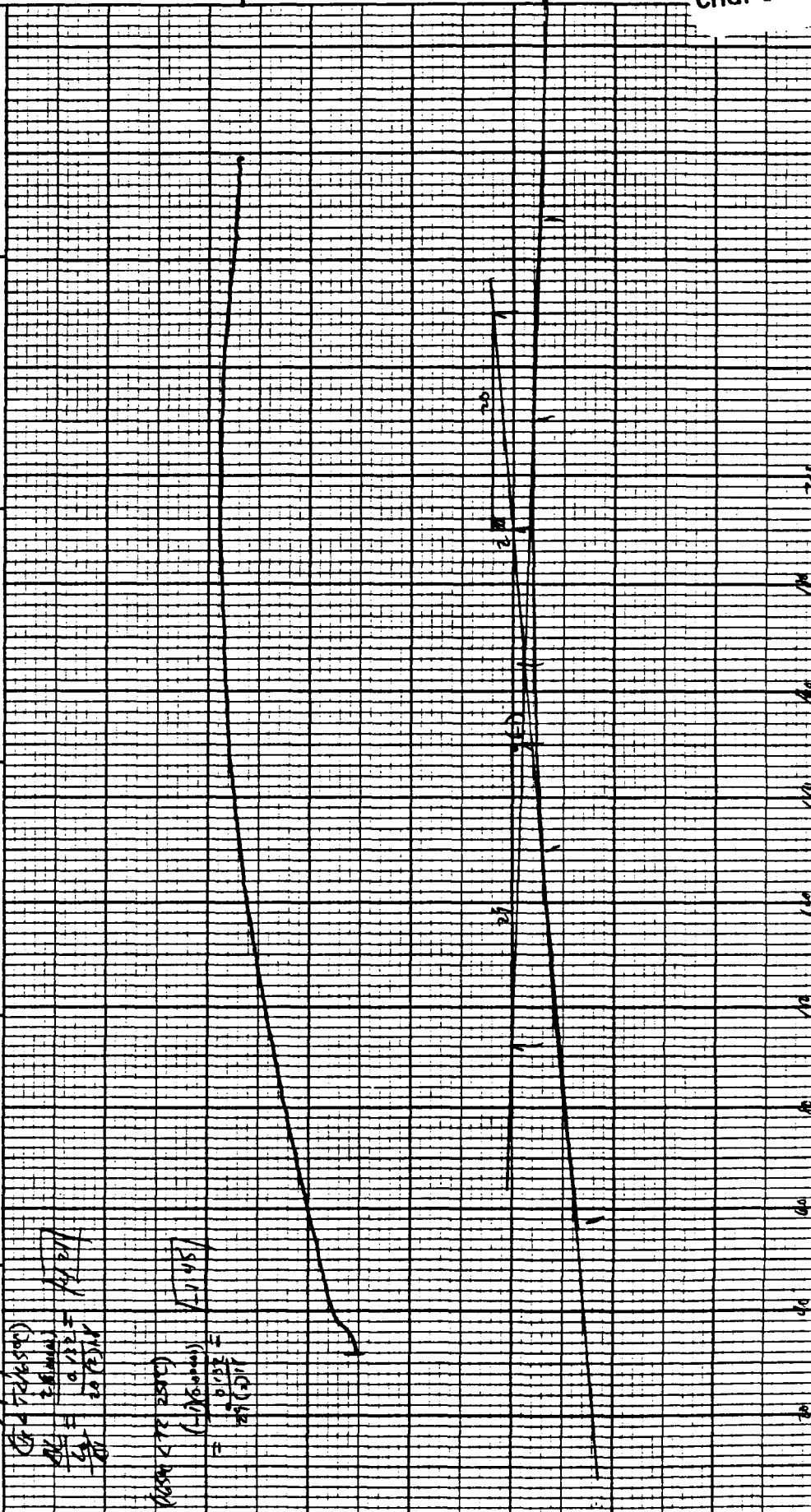
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MEASURED VARIABLE

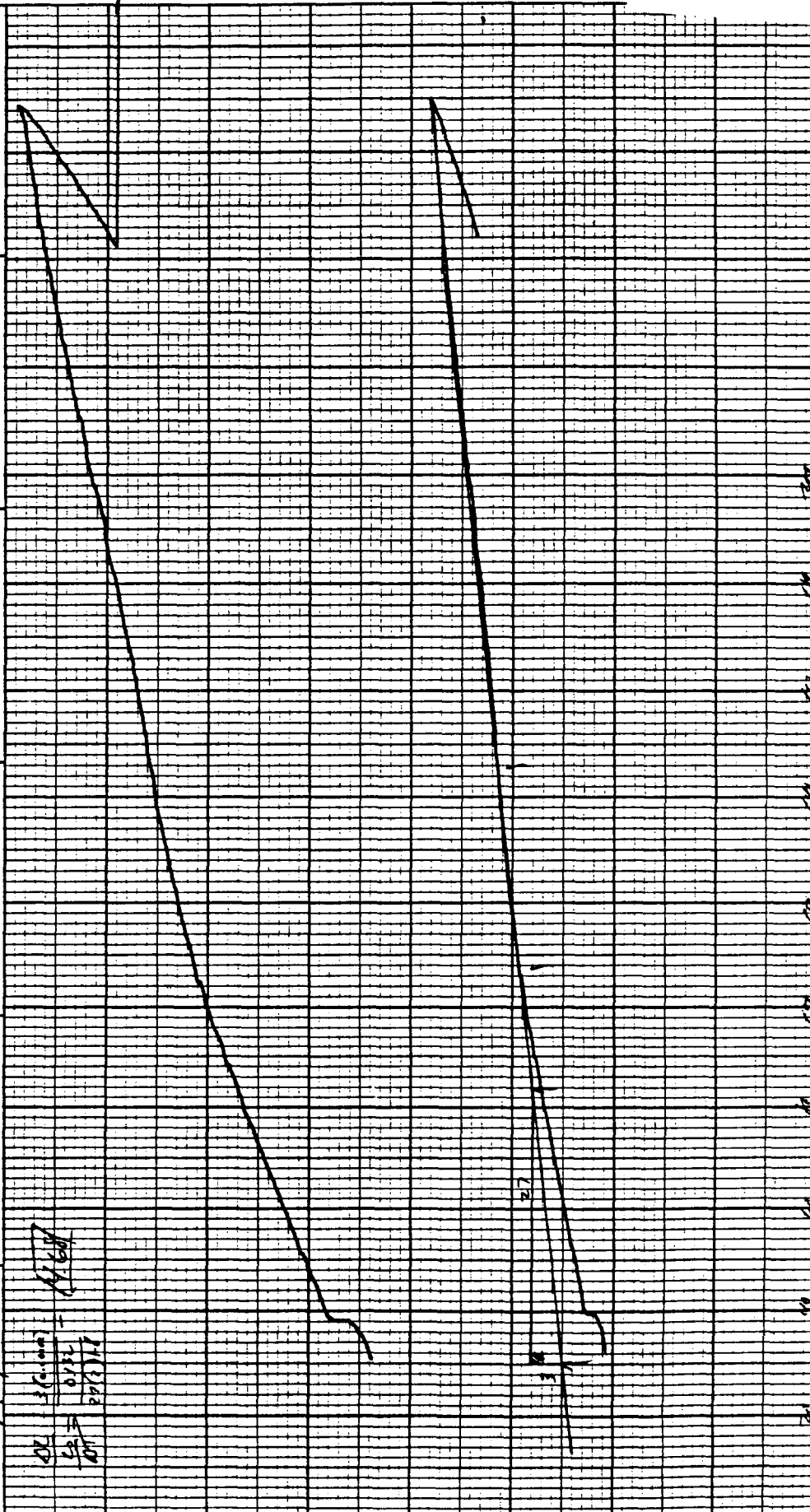
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PART NO. 9900001

RUN NO. _____ OPERATOR <u>TR</u> SAMPLE: <u>D09335-1-(3)</u> ATM <u>400</u> @ <u>577</u> FLOW RATE <u>3.5064</u> <u>XP44</u>	T-AXIS SCALE, °C/in. <u>50/20</u> PROG. RATE, °C/min. <u>0</u> HEAT <input checked="" type="checkbox"/> COOL <u>ISO</u> SHIFT, in. <u>0</u>	DTA-DSC SCALE, °C/in. _____ (mcal/sec)/in. _____ WEIGHT, mg _____ REFERENCE _____	TGA SCALE, mg/in. _____ SUPPRESSION, mg _____ WEIGHT, mg _____ TIME CONST., sec _____ dY, (mg/min)/in. _____	TMA <u>5mm/min</u> SCALE, mils/in. <u>0.1/0.2</u> MODE <u>EXTAKE</u> SAMPLE SIZE <u>Q132</u> LOAD, g <u>10</u> dY, (10X), (mils/min)/in. _____
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RUN NO. <u>111514</u> OPERATOR <u>JD</u> SAMPLE: <u>D0435-1-(4)</u> ATM <u>4hr</u> @ <u>572</u> FLOW RATE <u>3-5164</u> <u>XPLV</u>	T-AXIS SCALE, °C/in. <u>20-70</u> PROG. RATE, °C/min <u>0</u> HEAT <input checked="" type="checkbox"/> COOL <u>ISO</u> SHIFT, in. <u>0</u>	DTA-DSC SCALE, °C/in. <u>(mcal/sec)/in</u> WEIGHT, mg <u>REFERENCE</u>	TGA SCALE, mg/in. <u>0.1/0.2</u> SUPPRESSION, mg <u>MODE <i>Examination</i></u> WEIGHT, mg <u>0.132</u> TIME CONST., sec <u>LOAD, g 0</u> dY, (mg/min) /in. <u>dY, (10X), (mils/min) /in</u>	TMA (in./in ²) SCALE, mils/in. <u>0.1/0.2</u> MODE <u>Examination</u> SAMPLE SIZE <u>0.132</u> LOAD, g <u>0</u> dY, (10X), (mils/min) /in.
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PART NO. 990088

RUN NO. <u>1114</u> OPERATOR <u>AD</u> SAMPLE <u>D0935-2-(1)</u> ATM <u>24</u> @ <u>50</u> FLOW RATE <u>3.5 L/min</u>	T-AXIS SCALE, °C/in. <u>20</u> PROG. RATE, °C/min <u>0</u> HEAT <u>COOL</u> <u>ISO</u> SHIFT, in. <u>0</u>	DTA-DSC SCALE, °C/in. <u>(mcal/sec)/in</u> WEIGHT, mg <u>REFERENCE</u>	TGA SCALE, mg/in. <u>SUPPRESSION, mg</u> WEIGHT, mg <u>TIME CONST., sec</u> dY, (mg/min)/in. <u>dy, (10X), (mils/min)/in</u>	TMA <u>(in/in)</u> SCALE, mil/in. <u>0.1/100</u> MODE <u>ELUTION</u> SAMPLE SIZE <u>0.262</u> LOAD, g <u>10</u>
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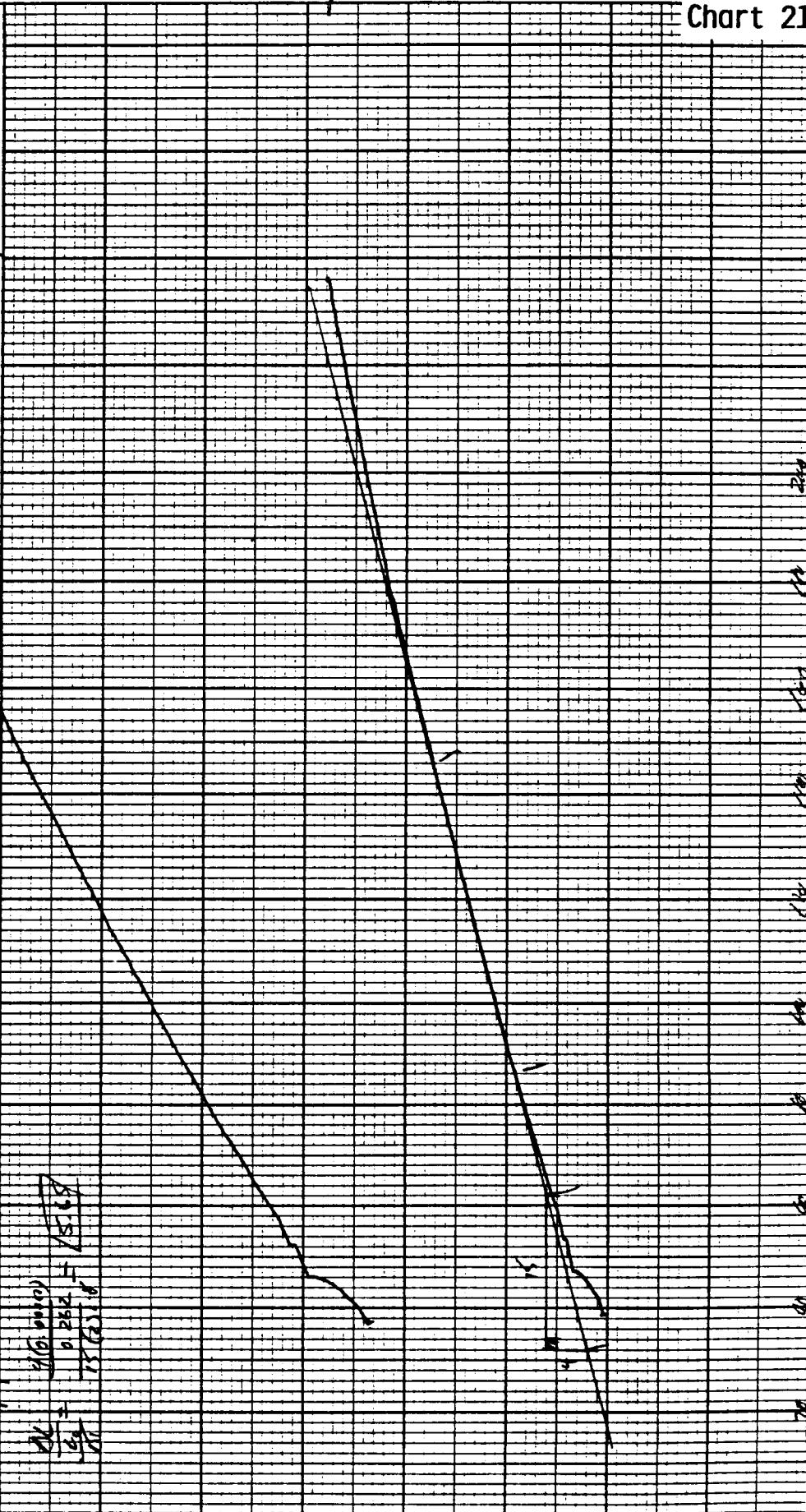


Chart 21B1

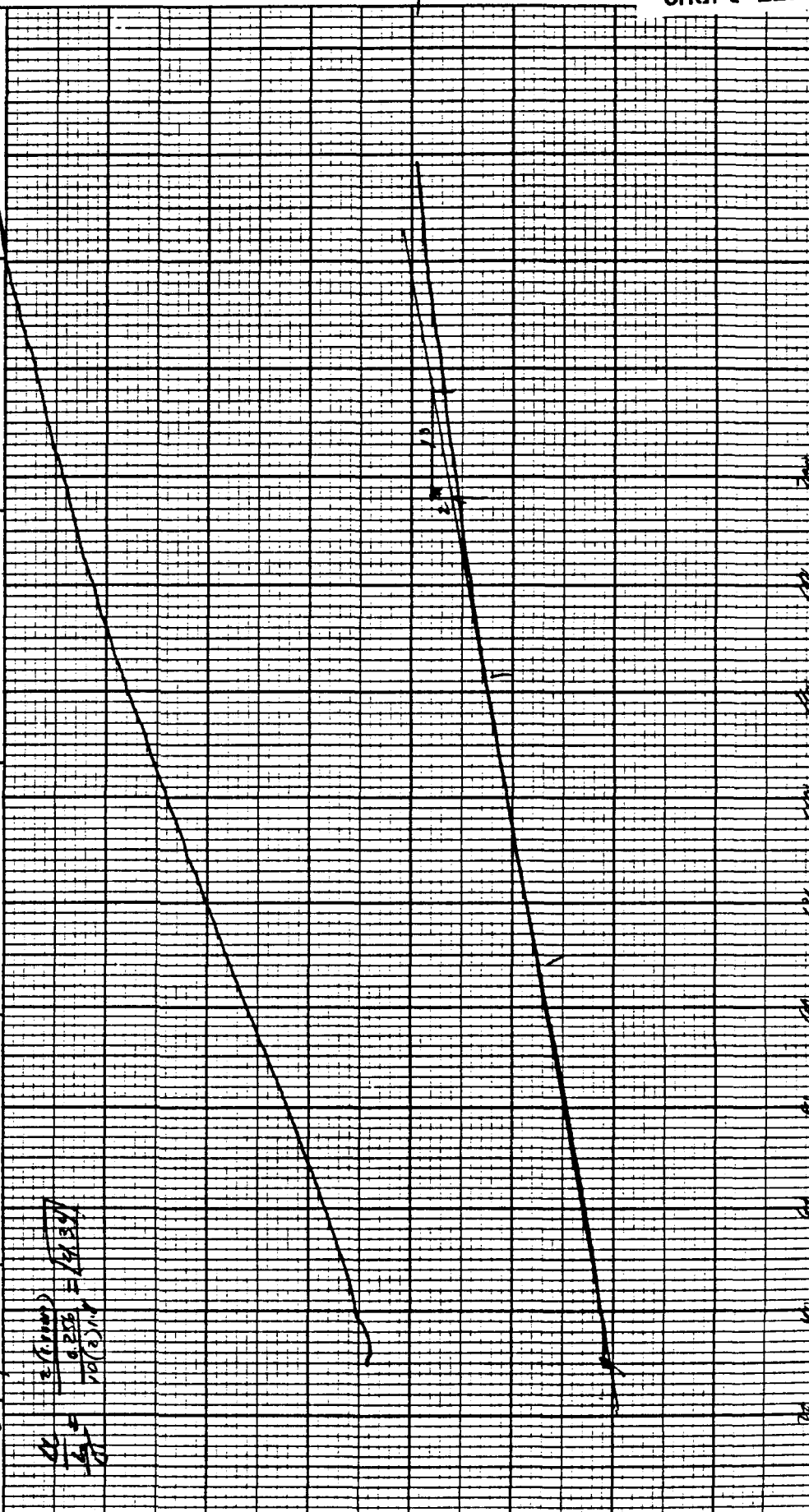
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MEASURED VARIABLE

PART NO. 990068

RUN NO. _____ OPERATOR <u>AD</u> SAMPLE: <u>D09335-2-(2)</u> ATM. <u>21</u> @ <u>370</u> FLOW RATE <u>3.5 SLH</u>	T-AXIS SCALE, °C/in. <u>20</u> PROG. RATE, °C/min <u>10</u> HEAT / COOL <u>ISO</u> SHIFT, in. <u>0</u>	DTA-DSC SCALE, °C/in. _____ (mcal/sec)/in. _____ WEIGHT, mg _____ REFERENCE _____	TGA SCALE, mg/in. _____ SUPPRESSION, mg _____ WEIGHT, mg _____ TIME CONST., sec _____ dY, (mg/min) / in. _____	TMA <u>(100) (in.)</u> SCALE, mils/in. <u>0.1/1.2</u> MODE <u>E/P (400K)</u> SAMPLE SIZE <u>0.23g</u> LOAD, g <u>10</u> dY, (10X) (mils/min) / in. _____
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MEASURED VARIABLE

PART NO. 990088

RUN NO. <u>12/15/0</u> OPERATOR <u>TH</u> SAMPLE: <u>D09335-2-(3)</u> ATM. AIR <u>0.58</u> FLOW RATE <u>1.55 L/min</u> <u>XPLY</u>	T-AXIS SCALE: °C/in. <u>50-24</u> PROG. RATE: °C/min. <u>10</u> HEAT <u>COOL</u> <u>ISO</u> SHIFT, in. <u>0</u>	DTA-DSC SCALE: °C/in. <u>(mcal/sec)/in.</u> WEIGHT, mg <u>REFERENCE</u>	TGA SCALE, mg/in. <u>SUPPRESSION, mg</u> WEIGHT, mg <u>TIME CONST., sec</u> dY, (mg/min) /in. <u>100</u>	TMA <u>(in/in)</u> SCALE, mils/in. <u>0.1/0.1</u> MODE <u>0.140</u> SAMPLE SIZE <u>0.140</u> LOAD, g <u>10</u> dY, (10X), (mils/min) /in. <u>100</u>
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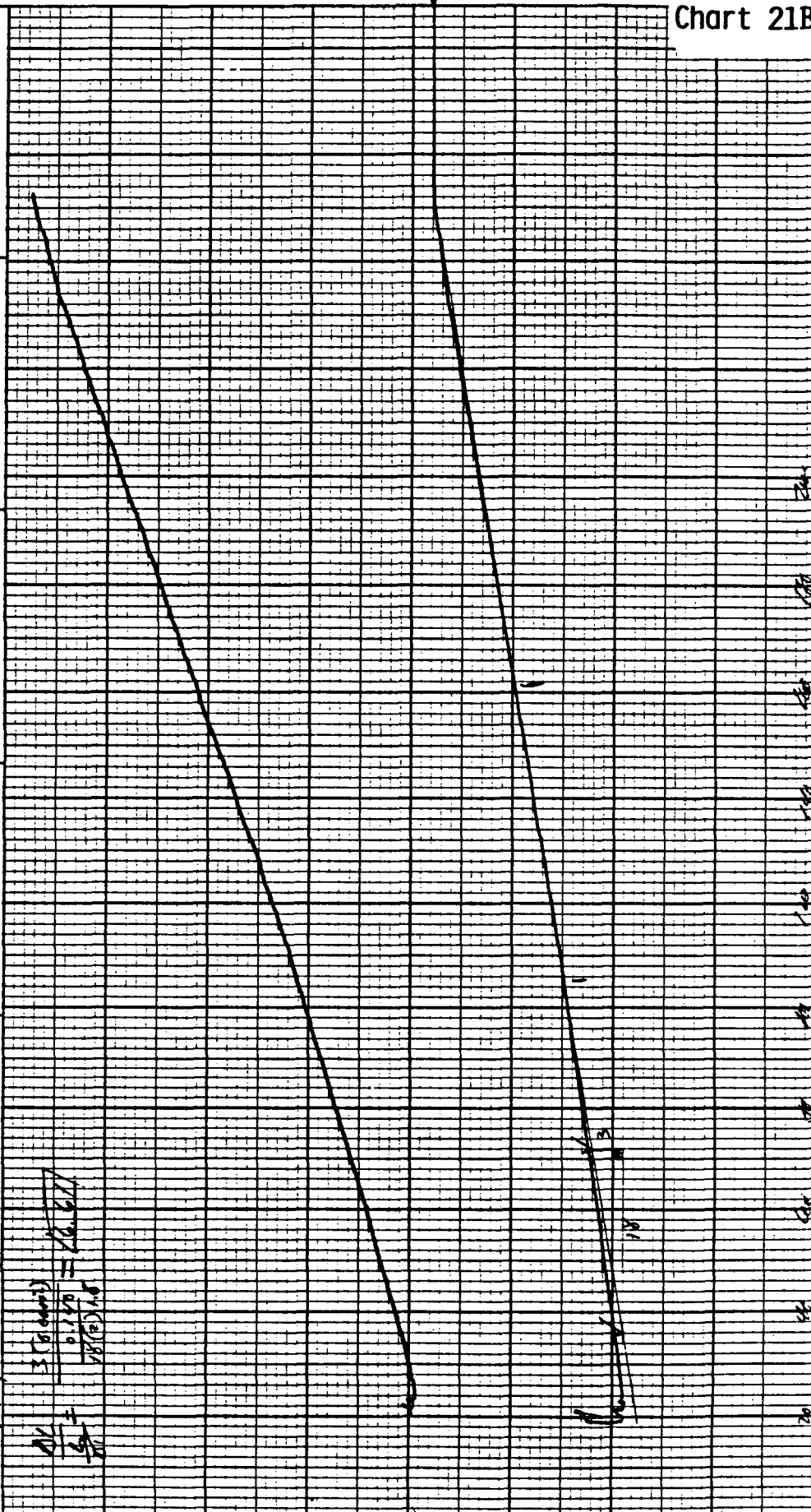


Chart 21B3

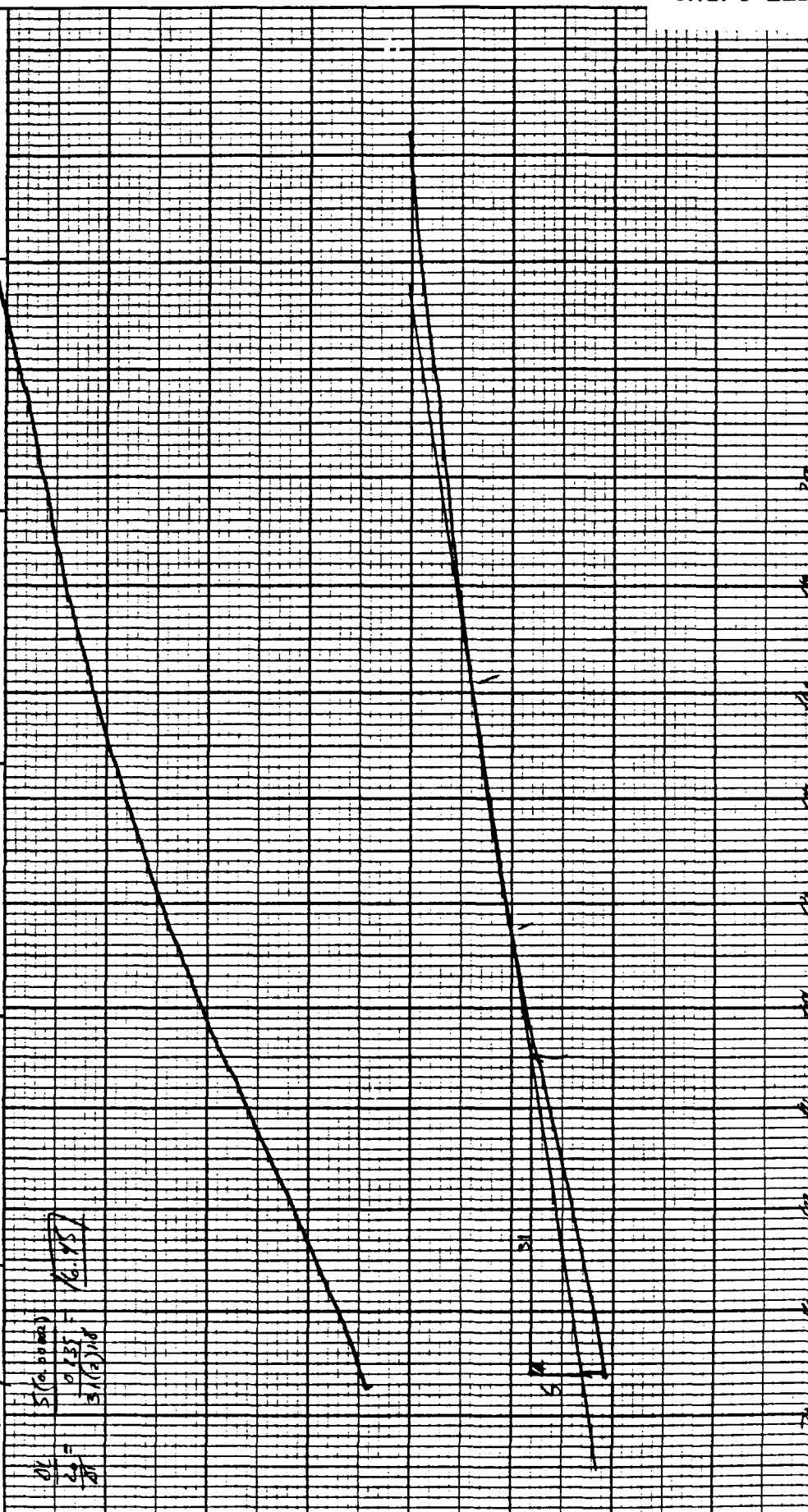
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MEASURED VARIABLE

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OF POOR QUALITY

PART NO. 990068

RUN NO. _____ OPERATOR <u>TJ</u> SAMPLE: <u>Do 935C-2-(4)</u> ATM. <u>Atm</u> @ <u>5.7P</u> FLOW RATE <u>5.0 L/min</u> <u>XPOLY</u>	T-AXIS SCALE: °C/in. <u>20</u> PROG. RATE: °C/min <u>20</u> HEAT <u>COOL</u> <u>ISO</u> SHIFT: in <u>0</u>	DTA-DSC SCALE: °C/in. _____ (mcal/sec)/in. _____ WEIGHT, mg _____ REFERENCE _____	TGA SCALE, mg/in. _____ SUPPRESSION, mg _____ WEIGHT, mg _____ TIME CONST., sec _____ dY, (mg/min)/in. _____	TMA <u>(air/in)</u> SCALE, mils/in. <u>0.1/0.2</u> MODE <u>EPI/AS/m</u> SAMPLE SIZE <u>0.139</u> LOAD, g <u>0</u> dY, (10X), (mils/min)/in. _____
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DU PONT Instruments MEASURED VARIABLE

ORIGINAL FACE IS
OF POOR QUALITY